DOCUMENT RESUME

ED 459 073 SE 065 393

TITLE	NOVA[R] Fall 2001 Teacher's Guide.
INSTITUTION	WGBH-TV, Boston, MA.
PUB DATE	2001-00-00
NOTE	55p.; Major funding from Sprint PCS, Northwestern Mutual Foundation, and Park Foundation. Published semiannually.
AVAILABLE FROM	WGBH Educational Foundation, 125 Western Avenue, Boston, MA 02134. Web site: http://www.pbs.org/nova/teachers/guidesubscribe.html.
PUB TYPE	Guides - Classroom - Teacher (052)
EDRS PRICE	MF01/PC03 Plus Postage.
DESCRIPTORS	*Academic Standards; Elementary Secondary Education; Instructional Materials; *National Standards; *Science Activities; Science Instruction; Science Programs; Television
IDENTIFIERS	National Science Education Standards; *NOVA (Television Series)

ABSTRACT

This teacher guide includes activity information for the program NOVA, Fall 2001. Background for each activity is provided along with its correlation to the national science standards. Activities include: (1) "Search for a Safe Cigarette"; (2) "18 Ways To Make a Baby"; (3) "Secrets of Mind"; (4) "Neanderthals on Trial"; (5) "Life's Greatest Miracle"; (6) "Methuselah Tree"; and (7) "Flying Casanovas." (YDS)

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NOVA

Major funding is provided by Sprint. Sprint PCS. Northwestern Mutual Foundation. PARK FOUNDATION

Fall 2001 Teacher's Guide

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Life's Greatest Miracle

Airs November 20, 2001

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Communication and education go hand-in-hand. As a teacher, there is clearly nothing more important than connecting directly with your students. That's why Sprint PCS, the wireless division of Sprint Corporation, is proud to support the newest generation of programs in the informative, award-winning NOVA series.

Now in its 28th year, NOVA offers a unique virtual window into the high-tech world in which we live and work. The series remains at the forefront of science, educating and inspiring with an in-depth look at the latest discoveries and innovations.

Since 1997, Sprint PCS has connected thousands of teachers, parents and students across the country through a variety of community relations programs. We are pleased to continue opening the lines of communication and exploration in the classroom and beyond through our sponsorship of the 2001 *NOVA Teacher's Guide*.

Sincerely,

Charles E. Levine
President, Sprint PCS

Sprint
Sprint PCS

Learning is most effective when the lessons are exciting and the teaching is inspired. This is the challenging formula NOVA strives for week after week. As an educator, you understand this challenge. Your ability to find fresh and inspiring new approaches to learning is the key to igniting young minds.

Helping people achieve successful futures has been the cornerstone of Northwestern Mutual for nearly 150 years. Our sponsorship of NOVA underscores our commitment to this tradition.

The Northwestern Mutual Foundation is proud to offer you another season of the *NOVA Teacher's Guide*. We hope it will become an important resource for you as you discuss this dynamic and award-winning series in your classroom.

Best wishes for a successful school year.

Edward J. Zore
President and Chief Executive Officer

Northwestern Mutual
Foundation

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Contents & Broadcast Schedule

		Earth & Space Science	General Science	Life Science	Physical Science	Social Studies	NOVA Activity
2	**NOVA in the Classroom** Find out what's new on NOVA Online and how NOVA is being used in classrooms nationwide.						
4	**Search for a Safe Cigarette*** Week of Oct. 2 • www.pbs.org/nova/cigarette/			●		●	
10	**18 Ways to Make a Baby*** Week of Oct. 9 • www.pbs.org/nova/baby/			●		●	
	Deadly Shadow of Vesuvius* (R) Week of Oct. 16 • www.pbs.org/nova/vesuvius/	●				●	
14	**Secrets of the Mind*** Week of Oct. 23 • www.pbs.org/nova/mind/			●			
	Sex: Unknown* Week of Oct. 30 • www.pbs.org/nova/gender/			●			
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Because of schedule changes, some NOVA programs do not have lessons.

* one-year off-air taping rights

(R) indicates a repeat program

lesson within this guide

lesson online at www.pbs.org/nova/teachers/

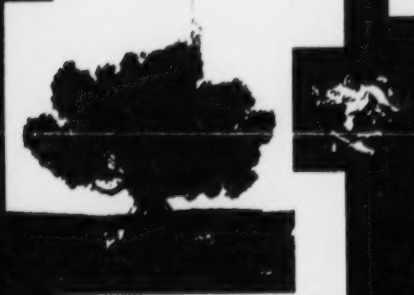
Broadcast Time Change

NOVA will now broadcast at 8pm EST (previously 9pm EST). NOVA is usually broadcast on Tuesday night; check your local listings to confirm broadcast dates and times.

Tune into Evolution

www.pbs.org/evolution/

In September, tune into "Evolution," an 8-hour miniseries that examines evolutionary science and the profound effect it has had on society and culture. A Web site will include multimedia educational resources to complement the program.



A co-production of the WGBH/NOVA Science Unit and Clear Blue Sky Productions, Inc., "Evolution" will premiere Sept. 24–27.

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NOVA in the Classroom

Life's Greatest Miracle

Dear Educators,

Many of you recall one of NOVA's most popular programs, "The Miracle of Life." This season, we bring you an entirely new version of the program, complete with all-new footage and the latest scientific understanding of the process of development. In "Life's Greatest Miracle," we use the latest imaging technologies and state-of-the-art computer animation to reveal the making of a human life, including the voyage of sperm toward the egg, the journey of the ovum down the fallopian tube, the development of budding brain cells and other organs, and more. We promise you and your students a journey you won't soon forget.

This fall we also bring you the science and social implications behind a timely but controversial public health topic—the tobacco industry's efforts to make a less toxic cigarette. In "Search for a Safe Cigarette," we probe the industry's motivation for making such a product, explain the science behind this effort, and explore its impact on current campaigns to end smoking. With the rise in teen-age smoking, this might be an excellent opportunity for you to discuss this issue with your students.

We hope these and our other fall programs will inspire lively debate, engaging science questions, and thoughtful discussions in your classrooms.

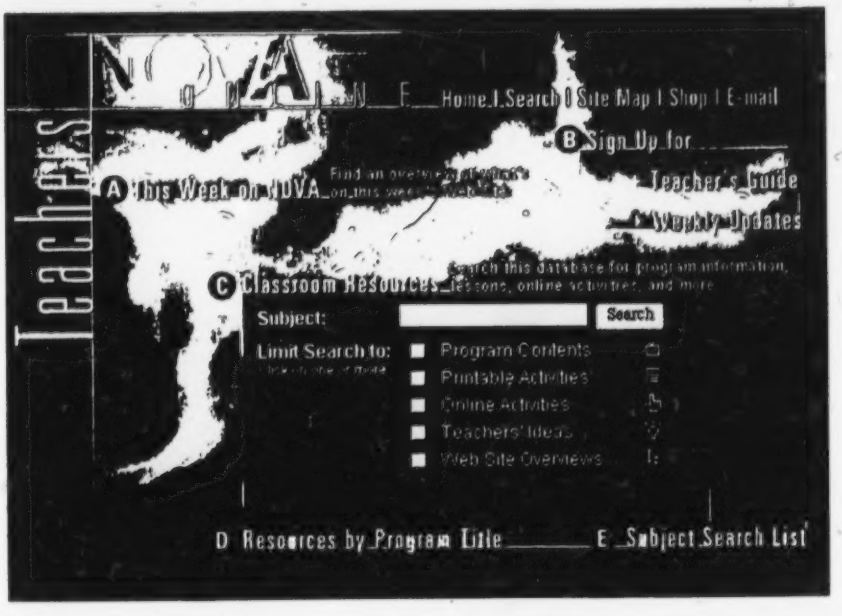
Paula S. Apsell
NOVA Executive Producer

Visit Our New Teachers Site www.pbs.org/nova/teachers/

A This Week on NOVA
Find a listing of all the features available for the companion Web site to each week's NOVA program. Each overview includes brief descriptions and grade-level designations for everything on the site.

B Sign Ups
Join our mailing list to receive weekly updates reminding you of upcoming programs and broadcast dates, as well as what you'll find online to help you integrate the Web into your curriculum. Also, sign up to receive our semiannual printed teacher's guide.

C Classroom Resources
Use our searchable database to locate more than 500 resources, including program contents that include information on video availability, a compendium of printable activities, a library of online activities, access to ideas from other teachers, and summaries of our Web sites.



D Resources by Program Title
Find links to all of our resources by program title.

E Subject Search List
Look here for the keywords we've used to categorize our Classroom Resources.

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NOVA Featured Teacher

Latin Classes and Roman Baths

Nick Young is bringing daily life in Ancient Rome alive for his students, in part by using NOVA's "Secrets of Lost Empires II: Roman Bath" program to give students a view of the culture and politics present at the height of the Roman Empire.

Students at University of Detroit Jesuit High School in Detroit, Michigan, have a three-year language requirement, and Young, who has been teaching for 32 years, tries to bring Ancient Rome into the 21st century. Young used the Roman Baths program and accompanying NOVA Online Web site (**www.pbs.org/wgbh/nova/lostempires/**) with four different Latin classes. (See *One Video, Many Uses* on this page).

All students view the entire program or segments with the following questions in mind:

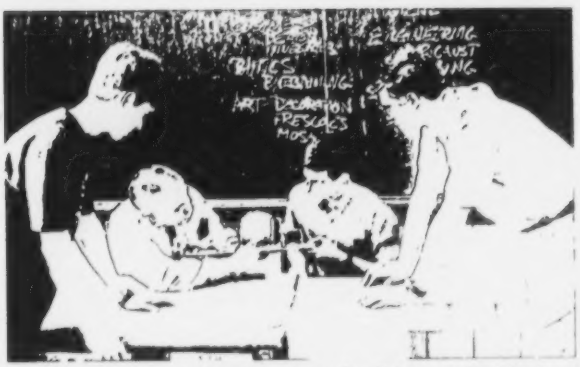
- What problems did the modern builders have?
- How did the modern builders figure out and operate the heating system?
- Where did the modern builders get the water?
- Is there anything like the Roman Baths in the modern world?

One focus for students in Young's Latin III class is the Roman government and its political processes. Young often used the Web site during class discussions. For example, using the "A Day at the Baths" section, students examined the functions of the various areas of the bath complex and discussed how politicians might have made use of their daily trip to the baths. Students also discussed why it was wise both in terms of politics and public welfare to build the great public baths.

The Web site's "Real Roman Recipes" section acquainted students with common foods. Both of these sections, along with "NOVA Builds A Bath," helped students to visualize the art and architecture of the baths. Finally, Young asked students to compare and contrast how Ancient Roman politicians used the baths and how modern-day politicians use public places in similar ways (e.g., campaigning).

Latin III students also make connections between the Roman and U.S. political systems and players. For example, by comparing the U.S. judicial system and the role of the U.S. Supreme Court with the Roman tribunes, Young says students achieve a better understanding of the workings of both governments.

For more information, Young can be contacted at **youngnb@aol.com**



From left, Devin Porter, teacher Nick Young, Dan Palmer, and Carl Martin study aspects of daily life in ancient Rome.

One Video, Many Uses

Nick Young used NOVA's "Roman Bath" program to introduce:

- Latin I students to daily life in the city and the building skills of the Romans;
- Latin II students to how the baths were built;
- Latin III students to various aspects of Roman life; and
- Latin IV students to a selection about a Roman bath from the Satyricon of Petronius, a 1st century AD novel.

Become a NOVA Featured Teacher

We'd like to hear from YOU! Tell us how you're using a NOVA program or NOVA Online in your classroom. If we choose to feature your classroom in our *NOVA Teacher's Guide*, we'll send you and your students six free NOVA videos or two Classroom Field Trip kits of your choice.

Send your ideas to:

Corinne Pierce
WGBH
125 Western Avenue
Boston, MA 02134
corinne_pierce@wgbh.org

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Search for a Safe Cigarette

Airs the week of October 2 • www.pbs.org/nova/cigarette/

Program Contents

Cigarettes are one of the most dangerous consumer products on the market. They are also one of the least regulated. NOVA chronicles scientific efforts over the past 50 years to achieve the elusive goal of a safe cigarette.

The program:

- chronicles the tobacco industry's development of cigarettes over the past 50 years, reviewing ongoing attempts to reduce the hazardous chemicals in cigarette smoke.
- describes the components of cigarette smoke and its harmful effects on the respiratory and circulatory systems.
- traces cigarette advertising over time, including a period when the industry marketed smoking as a positive lifestyle choice while secretly working to eliminate dangerous toxins in tobacco smoke.
- notes that the cigarette industry chose not to market "safer" cigarettes for fear of lawsuits resulting from the implication that previous products were dangerous.
- provides statistics on cigarette use, production, health, and money involved in the industry.
- raises the question of the lack of federal regulatory oversight by pointing out that cigarettes are not subject to the same testing procedures required of other consumer products.

Before Watching

1. What do students think happens when cigarettes burn? How do their ingredients affect the body? What makes cigarettes addictive? Write students' responses on the chalkboard.

2. Organize students into five groups. Assign each group one of the following aspects of the program. As students watch, have group members take notes on their assigned topic of:

- what experiments industry scientists undertook to make a safe cigarette.
- how industry scientists used the data from their experiments.
- how inhaled smoke affects the body's systems.
- how cigarette advertising evolved.
- what governmental regulatory and legal oversight of the industry has been.

Advance, Eclipse, and Accord are several brands of cigarettes featured in "Search for a Safe Cigarette."

After Watching

1. Have group members meet to review their notes on their assigned topics. Have each group decide on five critical points about their topic. Discuss their observations and list their responses on the chalkboard. Which facts in the program surprised students most? Which areas would they like more information about?

2. Continue the discussion with the questions that follow. Can a safe cigarette be made? Should one be made? How would people know whether cigarettes were actually safer? What kind of evidence would people need to have to convince them that a safer cigarette exists?

Activity Setup

Objective

To review a range of federal and state actions on tobacco issues and consider the government's role in public health.

Materials for each group

- copies of the *Who Should Decide What's Safe?* Part I activity sheet on page 6
- copies of the *Who Should Decide What's Safe?* Part II activity sheets on pages 7–8
- access to print and Internet resources

Procedure

1. Organize students into groups. Provide each group member with a copy of the *Who Should Decide What's Safe?* Part I activity sheet.
2. Have students read the excerpt from the U.S. Code regarding cigarette labeling and then discuss in their groups what they believe the impact of this original initiative is from their own perspective. Then have students answer the Part I questions on their activity sheets. *Note:* This excerpt is taken from the U.S. Code: Chapter 36—Cigarette Labeling and Advertising. While it represents one of the seminal laws enacted regarding tobacco, it does not include laws regarding billboard advertisements or amendments to cigarette labeling and advertising made since the original legislation. Find a complete version of the chapter at U.S. House of Representatives—Downloadable U.S. Code: **uscode.house.gov/title_15.htm**
3. After students have discussed the questions, provide each group member with a copy of the *Who Should Decide What's Safe?* Part II activity sheet, which lists legislated actions that states have taken regarding tobacco issues. For additional state information or to order a copy of the full text of all state actions, visit: **www.cancer.org/tobacco/legislation.html**
4. Have students discuss the state regulations regarding tobacco products. Have them determine which regulations are unfavorable or favorable to the smoking industry. Then have students answer the questions listed on the Part II activity sheet.
5. When students have finished, lead a class discussion about society's responsibility to the public health of its citizens. When should society intervene in public health issues of its citizens and to what extent? What role, if any, should the federal versus state governments play in these issues? What are the responsibilities, if any, of society's citizens?
6. As an *extension*, have students do additional research to compare tobacco laws enacted by their own state to those laws enacted by other states. How does their state compare? Of the laws currently enacted among states, which, if any, do they think their state should or should not try to adopt and why?

Standards Connection

The activity found on pages 6–8 aligns with the following *National Science Education Standards*.

Grades 5-8

Science Standard F:
Science in Personal and Social Perspectives

Risks and benefits

- Important personal and social decisions are based on perceptions of benefits and risks.

Grades 9-12

Science Standard F:
Science in Personal and Social Perspectives

Science and technology in local, national, and global challenges

- Science and technology are essential social enterprises, but alone they can only indicate what can happen, not what should happen. The latter involves human decisions about the use of knowledge.

Who Should Decide What's Safe?

NOVA Activity **Search for a Safe Cigarette, Part I**

Some tobacco companies are working to develop a cigarette they say will be safer than products currently on the market. But who decides what's safe? Enacted in 1965, landmark federal legislation required health warnings on cigarette packages. In 1984, the law was amended to require one of the four warning labels below in most cigarette-related advertising. Read the federal laws regarding cigarette package labeling and advertisements and then decide what role you think the government should play in public health concerns.

U.S. Code

Title 15—Commerce and Trade
Chapter 36—Cigarette Labeling and Advertising
Sec. 1333. Labeling; requirements; conspicuous statement

Required warnings; packages; advertisements

It shall be unlawful for any person to manufacture, package, or import for sale or distribution within the United States any cigarettes the package of which fails to bear, in accordance with the requirements of this section, one of the following labels: (see below)

It shall be unlawful for any manufacturer or importer of cigarettes to advertise or cause to be advertised (other than through the use of outdoor billboards) within the United States any cigarette unless the advertising bears, in accordance with the requirements of this section, one of the following labels:

SURGEON GENERAL'S WARNING: Smoking Causes Lung Cancer, Heart Disease, Emphysema, and May Complicate Pregnancy.

SURGEON GENERAL'S WARNING: Quitting Smoking Now Greatly Reduces Serious Risks to Your Health.

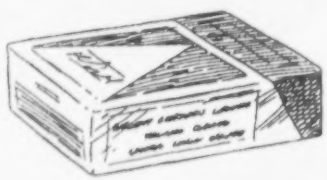
SURGEON GENERAL'S WARNING: Smoking By Pregnant Women May Result in Fetal Injury, Premature Birth, and Low Birth Weight.

SURGEON GENERAL'S WARNING: Cigarette Smoke Contains Carbon Monoxide.

Questions

Write your answers on a separate sheet of paper.

1. What impact do you think these warnings have had on the smoking population? Defend your reasoning.
2. Evaluate each warning. What message does each warning convey?
3. Would different language create more of an effect? If so, what?
4. Is it enough to warn consumers that a product is dangerous or should its availability be controlled? Explain your answer.



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Who Should Decide What's Safe?

NOVA Activity **Search for a Safe Cigarette, Part II**

The American Lung Association has compiled a comprehensive guide to state tobacco control laws, titled State Legislated Actions on Tobacco Issues.* The following is an excerpt of some of those laws.

State Legislated Actions on Tobacco Issues

Restrictions on Smoking in Public Places	
	Forty-nine states and the District of Columbia have clean indoor air provisions restricting smoking in certain places. These laws range from simple limited restrictions, such as designated areas in schools, to laws that limit or ban smoking in virtually all public places, including elevators, public buildings, restaurants, health facilities, public conveyances, museums, shopping malls, retail stores, and educational facilities (Vermont). California requires enclosed separately ventilated smoking areas in private workplaces including bars and restaurants, or smoking must be banned entirely. Forty-four states and the District of Columbia restrict smoking in government workplaces and twenty-two states and the District of Columbia restrict smoking in private sector working places.
Tobacco Excise Taxes	
Cigarettes	All 50 states and the District of Columbia impose an excise tax on cigarettes.
Youth Access	
Age Restrictions on Sales of Tobacco Products	All 50 states and the District of Columbia prohibit the sale of tobacco products to minors. Most states define minors as persons under 18 years of age, however, enforcement varies widely.
Penalties to Minors	Forty-four states penalize minors for tobacco-related offenses.
Restrictions on Distribution of Tobacco Product Samples or Sales of Single Cigarettes	
Tobacco Product Samples	Forty-five states and the District of Columbia restrict the distribution of free samples of tobacco products.
Sales of Single Cigarettes	Thirty-three states restrict the sale of cigarettes outside of their original package.
Restriction on Sales of Tobacco Products in Vending Machines	Forty-three states and the District of Columbia restrict the placement of tobacco product vending machines. Fifteen states allow vending machines in any location with a locking device or within the direct line of sight of clerks.
Smoker Protection Laws	
	Twenty-nine states and the District of Columbia passed some form of smoker protection legislation between 1989 and 1996.
Tobacco Product Disclosure	
	Five states require tobacco product disclosure information.
Tobacco Divestment	
	Massachusetts passed the first state law to prohibit new public pension funds from investing in stocks, securities, or other obligations of any companies that derive more than 15 percent of their revenue from the sale of tobacco products and requires divestment of existing investments.
Tobacco Liability	
Industry Protection	Five states passed legislation that effectively caps the appeal bond for the punitive damages portion of a judgment in a civil action. Florida and Kentucky have set the limit for supersedes bonds at $100 million, while Georgia, North Carolina, and Virginia have imposed a limit at $25 million.
Tobacco Settlement Funds	Forty-one states have made decisions which provide for the allocation of settlement dollars to tobacco prevention programs. The amounts range from $18.8 million for prevention programs in Maine, to $500,000 in Kansas. Eight states have allocated settlement amounts close to or above the Centers for Disease Control minimum recommendations for statewide tobacco prevention programs.

* Excerpted with permission from 2000 State Legislated Actions on Tobacco Issues.

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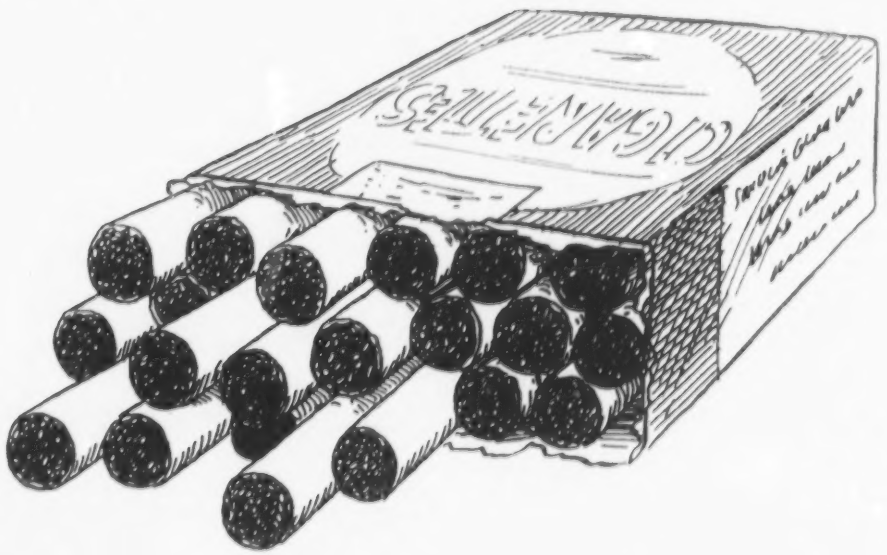
Who Should Decide What's Safe?

NOVA Activity **Search for a Safe Cigarette, Part II**

Questions

Write your answers on a separate sheet of paper.

1. State laws regarding tobacco issues vary widely. Which state laws do you think go too far in their mandates? Which don't go far enough? Explain your reasoning.
2. What role, if any, should the federal government play in regulating tobacco products? What role, if any, should each state play? What role, if any, should each citizen play? Who should decide what is and is not safe and why?
3. If the tobacco industry introduces a safer cigarette, who should evaluate that product's safety? The government? The tobacco industry? The press? Non-profit organizations? People who smoke? Some other group or person? A combination of groups? Explain your choice of evaluator.



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Activity Answer

There is no right answer when deciding the role of government, groups, or individuals in public health issues. Students may argue that the government should only intervene in public health when there is an imminent threat, such as the spread of an infectious disease. Other students may argue that it is the government's role to help inform and protect citizens from any dangerous products. Allow students to debate all points of view.

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Resources

Article

Stephenson, Joan.
"A 'Safer' Cigarette? Prove It, Say Critics."
Journal of the American Medical Association, Vol. 283, No. 19, May 17, 2000, p. 2507.
Reviews R.J. Reynolds Tobacco Company's claim that Eclipse cigarettes may present less risk of cancer and reports the reaction by public health officials, scientists, and anti-smoking activists to that claim.

Web Sites

NOVA Online—Search for a Safe Cigarette
www.pbs.org/nova/cigarette/
On this Web site, investigate cigarette design, read about the history to develop a safer cigarette, learn how nicotine works in the brain, and explore the basics of combustion.

Cornell Law School Legal Information Institute
www.law.cornell.edu/states/listing.html
Gathers state-by-state, Internet-accessible sources of the constitutions, statutes, judicial opinions, and regulations for the 50 states, plus D.C., and the U.S. territories and affiliated jurisdictions.

Massachusetts Tobacco Control Program
www.state.ma.us/dph/mtcp/home.htm
Offers information and resources related to the Massachusetts government program dedicated to addressing the health risks associated with tobacco use.

Summary of Scientific Tests Regarding Tobacco-Heating Eclipse Cigarettes
www.eclipsescience.com/
Includes information from the R.J. Reynolds Tobacco Company about scientific tests conducted on Eclipse cigarettes that produce smoke primarily by heating tobacco, rather than burning it.

Tobacco Control
www.lungusa.org/tobacco/
Offers ways to quit smoking and includes a section on teens against tobacco use.

18 Ways to Make a Baby

Airs the week of October 9 • www.pbs.org/nova/baby/

Program Contents

Advances in reproductive technology have enabled doctors and prospective parents to explore many new methods of conception. NOVA examines infertility treatments that push the limits of biology.

The program:

- introduces the technique of *in vitro fertilization* (IVF), a significant breakthrough in 1978 that is now a mainstream treatment.
- presents the challenges of infertility: One in six couples struggles with infertility issues, with the odds of conceiving against them.
- notes that infertility treatments are painful and emotionally draining, and there is an increased chance of multiple pregnancies, which can result in premature birth and a risk of disabilities.
- illustrates the process of micromanipulation, which allows doctors to select and inject sperm into eggs, and to perform microscopic procedures on developing embryos.
- describes advances in egg donation, the transfer of parts of donor eggs, and sperm sorting to increase the odds of having a child of a specified gender.
- raises ethical questions about the implications of reproductive technology.

Before Watching

1. To get students thinking about the possibility of genetically engineered children, have each student make a list of all the characteristics they would want a son or daughter to have. Organize students into small groups to classify their characteristics by physical attributes and skills. Write the classification categories on the chalkboard. Discuss how many of these might be influenced or controlled by genes. What else influences the characteristics?

2. Discuss the terms *DNA, chromosome, gene, egg, sperm,* and *fertilized egg* with the class to help them understand the program's basic science concepts.

Sixty-three-year old Arceli Koh with her newborn daughter, Cynthia.

After Watching

1. Discuss with students how they feel about the issues presented in the program. What ethical issues do students envision due to the new reproductive technology? Have students review which of their feelings are based on evidence, and which are based on opinion or speculation.

Activity Setup

Objective

To consider some of the ethical, legal, and social issues related to allowing a post-menopausal woman to give birth.

Materials for each student

- copy of the *Motherhood After Menopause* activity sheet on page 12

Procedure

1. Tell students they will be looking at the ethical, legal, and social implications of a case involving *in vitro fertilization*, which involves taking a woman's eggs, fertilizing them in a lab with a man's sperm, and then transferring the resulting embryos to a woman's uterus a few days later to develop naturally. The case involves a woman who becomes pregnant after menopause and has a child at 63 years old.
2. Organize students into groups and give each student a copy of the *Motherhood After Menopause* activity sheet.
3. Read the case study as a class so that the situation is clear to everyone. Allow students time to discuss their opinions about this case. Have each group present its opinions; allow for dissenting opinions among group members. Have each group write a paragraph summarizing the group's majority opinion and a paragraph summarizing the group's minority opinion.
4. To close, record the different viewpoints presented by students on the board. With students, identify the major themes in the arguments and allow students time to debate those themes.
5. As an *extension*, have students research and debate some of the issues regarding sperm or egg donation, such as how many individuals may be part of the process and who has what rights and responsibilities for the resulting child.

When Talking About Reproductive Technology

Be sensitive to students' comfort level when discussing infertility and ethical issues. Some students may not have prior knowledge of new reproductive technologies. You may want to review the procedures involved in *artificial insemination by donor, surrogate embryo transfer, surrogate motherhood,* and *in vitro fertilization*. (See *Resources* on page 13 for more information.)

Standards Connection

The activity found on page 12 aligns with the following *National Science Education Standards*.

Grades 5-8

Science Standard F:
Science in Personal and Social Perspectives

Science and technology in society

- Science influences society through its knowledge and worldview. Scientific knowledge and the procedures used by scientists influence the way many individuals in society think about themselves, others, and the environment. The effect of science on society is neither entirely beneficial nor entirely detrimental.

Grades 9-12

Science Standard F:
Science in Personal and Social Perspectives

Science and technology in local, national, and global challenges

- Understanding basic concepts and principles of science and technology should precede active debate about the economics, policies, politics, and ethics of various science- and technology-related challenges. However, understanding science alone will not resolve local, national, or global challenges.
- Individuals and society must decide on proposals involving new research and the introduction of new technologies into society. Decisions involve assessment of alternatives, risks, costs, and benefits and consideration of who benefits and who suffers, who pays and gains, and what risks are and who bears them.

Fertility Frontiers

NOVA Activity **18 Ways to Make a Baby**

Medical technology now offers at least 18 different ways to make a baby, allowing post-menopausal women to conceive, single-sex couples to have children, and children to have as many as three "mothers" (genetic, birth, and social) and two "fathers" (genetic and social). As fertility options increase, so do the issues surrounding children born by these methods. Read one case study below and consider some of the complexities involved with these technologies.

Motherhood After Menopause

Arceli Keh and her husband, Isagani, have been married for 16 years when they decide to try to conceive. Arceli retires from her job as a bank worker to have a baby. Isagani continues working.

To gain entrance into the fertility program, which has an upper age limit of 55, Arceli tells doctors she is 50 years old. At that time, she is 60. Arceli passes all the medical tests she is given, including a treadmill test and variety of blood tests.

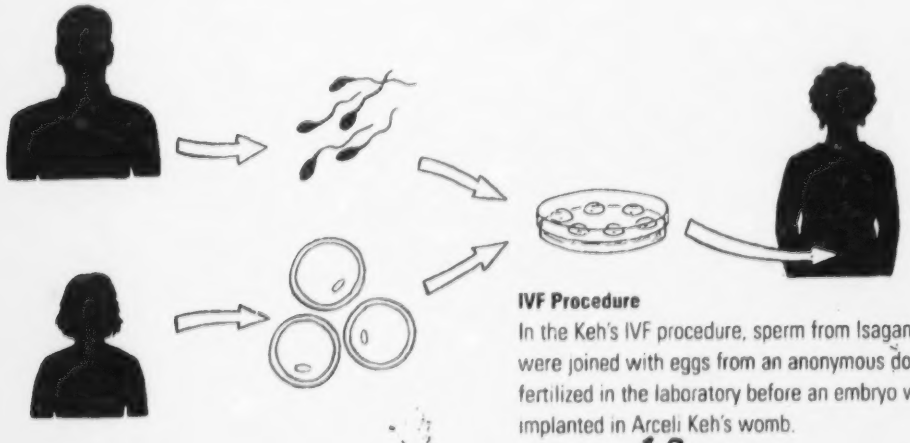
Arceli has already been through menopause, and is no longer producing her own eggs. She and Isagani go to a fertility clinic for in vitro fertilization (IVF) treatments, in which eggs from an anonymous younger donor are fertilized with Isagani's sperm and then implanted in Arceli's womb, which is made ready for pregnancy by hormones. The couple spend about $50,000 on infertility treatments.

On November 7, 1996—after going through five IVF transfer cycles—the Keh's have a baby girl, named Cynthia. Arceli is 63-years-old when she gives birth.

Questions

Write your answers on a separate sheet of paper.

1. What criteria would you set for a couple entering a fertility clinic, such as age, financial status, marital status, etc.? Who should decide that criteria? The medical community? The society in which they live? The couple themselves? Defend your reasoning.
2. Since Arceli passed the medical tests that qualified her for the fertility program, does it matter how old she was? Why or why not? How do you feel about what she did to get into the fertility clinic?
3. What other ethical, legal, or social issues does this case study bring up?



IVF Procedure

In the Keh's IVF procedure, sperm from Isagani Keh were joined with eggs from an anonymous donor and fertilized in the laboratory before an embryo was implanted in Arceli Keh's womb.

Activity Answer

In general, as a woman ages, her chances of becoming pregnant decrease and the health risks to the fetus and the mother increase. Assisted reproductive technologies often offer these women and other couples with fertility problems the only hope for having a child.

According to an interview on The NewsHour with Jim Lehrer, Arceli's doctor, Richard Paulson, says the upper age limit set by his clinic is an arbitrary number, chosen years before Arceli's case. Paulson says the limit is based on known averages of when a woman experiences menopause and the ability to bear children. The clinic's limit of 55 years old is about five years older than the age of natural menopause, and about 10 years beyond the age of natural childbearing, according to the interview.

In terms of age requirements, some women maintain that as long as they meet health requirements, they should be allowed to take advantage of assisted reproductive technologies.

Opponents of post-menopausal pregnancies question whether the health risks of such a pregnancy and the age of the parents in relation to the child are unfair to the expectant child.

In analyzing the case, students may have opinions that are based on emotional, ethical, legal, or social grounds. Accept all responses for discussion, being sensitive to each student's viewpoint.

Resources

Books

Andrew, Lori B.
The Clone Age, Adventures in the New World of Reproductive Technology.
New York: Henry Holt and Company, 1999.
Explores the legal and ethical ramifications of the many changes in reproductive technology.

Silver, Lee M.
Remaking Eden: How Genetic Engineering and Cloning Will Transform the American Family.
New York: Avon Books, 1998.
Explains the scientific advances behind reproductive technologies.

Web Sites

NOVA Online—18 Ways to Make a Baby
www.pbs.org/nova/baby/
On this Web site, read how many ways there are to make a baby, learn some reasons behind the fears of cloning humans, follow the path of male and female fertility from infancy to adulthood, and delve into mitosis and meiosis.

Fertility Race Part Seven: Twenty Years of Test-Tube Babies
news.mpr.org/news/features/199711/20_smiths_fertility/part7/
Describes how in vitro fertilization techniques have developed over the past 20 years. Includes some relevant statistics, a glossary of terms, and a list of links for additional information.

Secrets of the Mind

Airs the week of October 23 • www.pbs.org/nova/mind/

Program Contents

Dr. Vilayanur Ramachandran, a world leader in brain science, explores four patients with unusual delusional symptoms and shows how their cases have implications for the way in which all humans understand their world.

The program:

- relates that Ramachandran's work has revealed clues about how certain brain structures control fundamental thought processes.
- describes the doctor's work with patients in whom the brain's parietal lobes—which control spatial understanding and visual recognition—have been damaged through injury or stroke.
- profiles Ramachandran's patients: One man who has lost an arm in a motorcycle accident continues to feel phantom sensations in his missing limb; a female stroke victim who has a problem in sensing any activity on one side of her field of view; a young man with a head injury who believes his parents are impostors, and another young man with temporal lobe epilepsy who has seizures and hallucinations that produce profound spiritual feelings.
- concludes with questions about whether human brains are hard-wired for certain types of thoughts.

Before Watching

1. The brain has two main hemispheres, left and right. Use drawings or photographs to ensure students' understanding of the brain's structure.

2. To help students understand left- and right-brain dominance, have them test and record their dominant eye, ear, hand, and foot, as follows.

Eye—Have students hold a thumb out at arm's length, and with both eyes open, cover a vertical line drawn on the chalkboard. Have them close one eye at a time to determine which line of sight is actually covering the line. This is the dominant eye.
Ear—Have students pretend to listen to someone through the wall. The ear they put to the wall is the dominant ear.
Hand—Have students write their name. Their writing hand is the dominant hand.
Foot—Have students step up onto a step, or kick a ball. The foot they use is the dominant foot.

Students who show a clear dominance for one side (eye, ear, hand, and foot) exhibit a brain dominance of the opposing side. That is, a student who is right-side dominant is actually left-brain dominant. Poll the class to find the number of people with right-, left-, or no-brain dominance. Are there any patterns? Is the class sample large enough to draw a conclusion? What does left-, right-, or no-brain dominance tell about someone?

Dr. Ramachandran explores the brain's contribution to how humans understand their world.

After Watching

1. Have students read the story of Phineas Gage, a railroad worker whose head was impaled by a steel rod, and discuss the changes that this incident brought about. What part of his brain was affected?

Find the story at your local library or online at The Phineas Gage Information page at:
www.hbs.deakin.edu.au/gagepage/pgage.htm

Activity Setup

Objective

To analyze and interpret brain hemispheric dominance in order to understand its impact on learning.

Materials for each student

- copy of the *Think About It* activity sheet on page 16
- copy of the *Think About It Key* activity sheet on page 17
- copy of the *Some Types of Learners* activity sheet on page 18

Procedure

1. Many people's brains seem to have a dominant side that is believed to have implications for how a person thinks and learns. Students will be given an inventory to determine which side of their brain seems to be more dominant.
2. Before they begin, tell students the brain is a very complex organism, and that researchers are discovering that no one part of the brain controls any one behavior. There are also many different ways to learn. This activity demonstrates how some of the ways a person can think and learn are associated with right- or left-hemisphered brain activity.
3. Distribute copies of the *Think About It* activity sheet to each student and ask them to answer the 16 questions.
4. Give all students a copy of the *Think About It Key* activity sheet and have them analyze their answers.
5. Distribute copies of the *Some Types of Learners* activity sheet and allow time for students to read it and compare the information to their results. Discuss with students whether they think the descriptions fit them. If students have a more or less equal distribution between hemispheres, ask them which of the descriptions best describes them.
6. Discuss the materials and their results with the class. Analyze the class results for any patterns.
7. As an *extension*, have students conduct a larger survey to increase their sample size and graph their data. How do the patterns look when more people are interviewed? What new patterns emerge, if any?

Standards Connection

The activity found on pages 16–18 aligns with the following *National Science Education Standards.*

Grades 5-8

Science Standard C:
Life Science

Regulation and behavior

- Behavior is one kind of response an organism can make to an internal or environmental stimulus. A behavioral response requires coordination and communication at many levels, including cells, organ systems, and whole organisms. Behavioral response is a set of actions determined in part by heredity and in part from experience.

Grades 9-12

Science Standard C:
Life Science

The behavior of organisms

- Behavioral biology has implications for humans, as it provides links to psychology, sociology, and anthropology.

Think About It

NOVA Activity **Secrets of the Mind**

Circle the answer that best describes you. After you finish, check your results with the ***Think About It Key*** activity sheet.

① Would you classify yourself as a good or poor speller?
- good speller
- poor speller

② On a test or exam, which style of questions do you prefer to answer?
- true/false, multiple choice, matching
- essay, discussion

③ Is everything in your room neatly organized?
- yes
- no

④ When learning to play a new computer game, is it easier for you to:
- watch a friend play and imitate your friend's actions?
- carefully read the rules and follow the step-by-step instructions?

⑤ Would you rather plan out your schedule for the weekend, or just allow things to happen in a random manner?
- make plans for the weekend
- allow plans to evolve in a random manner

⑥ Are you usually punctual to class, school, and when turning in assignments?
- yes
- no

⑦ Would it be easier for you to write a news report about a sports star achieving a new record or to write a poem about your feelings about that achievement?
- news report
- poem

⑧ If you transferred to a new school, would it be more difficult to remember your new classmates' names or their faces?
- names
- faces

⑨ When given a choice of writing a report or drawing a poster about teen smoking, which might you choose?
- write a report
- draw a poster

⑩ When a guest speaker visits your school, are you more attentive to the logic of the speaker's words or the emotional impact of those words?
- the meaning of the speaker's words
- the emotional impact of the speaker's words

⑪ Would you find it easy or difficult to chat with a classmate without using your hands?
- easy to chat without hand gestures
- difficult to chat without hand gestures

⑫ Is your locker or book bag usually neat and organized or cluttered with old papers and assignments?
- neat and organized
- cluttered with old assignments

⑬ When you describe a movie that you've seen to a friend, do you give just the overall story or give lots of specific details about what happened?
- overall story
- many specific details

⑭ Do you do your best studying for an exam sitting erect in a chair or often walking around the room?
- sitting erect in a chair
- walking around the room

⑮ Do you prefer to study in an area with complete quiet or one with music or sounds in the background?
- quiet area
- background music or sounds

⑯ If given a difficult problem in your mathematics class, are you more likely to solve the problem in a very organized step-by-step manner or find the answer without being able to explain how you did so?
- solve the problem in an organized manner
- find the answer without being able to explain how

Think About It Key

h·i·e·r·o·g·l·y·p·h·i·c

n·e·a·n·d·e·r·t·h·a·l

m·e·t·h·u·s·e·l·a·h

NOVA Activity **Secrets of the Mind**

This survey demonstrates just one of the many aspects of the brain. Your brain is a complex organ; researchers are just now unraveling how it really works. Compare your answers to the information given below. Check off which part of the brain corresponds with your answer. Then tally how many of your answers might be considered right- or left-brained. A majority of the answers fitting one of the two categories indicates a tendency for brain dominance on that side. A similar number of answers in both categories shows a balance.

	Answer	Left Brain	Right Brain
1	• good speller—left brain • poor speller—right brain		
2	• true/false, multiple choice, matching—left brain • essay, discussion—right brain		
3	• yes—left brain • no—right brain		
4	• watch a friend play and imitate friend's actions—right brain • read the rules and follow the step-by-step instructions—left brain		
5	• make plans for the weekend—left brain • allow plans to evolve in a random manner—right brain		
6	• yes—left brain • no—right brain		
7	• news report—left brain • poem—right brain		
8	• names—left brain • faces—right brain		
9	• write a report—left brain • draw a poster—right brain		
10	• the meaning of the speaker's words—left brain • the emotions resulting from the speaker's words—right brain		
11	• easy to chat without hand gestures—left brain • difficult to chat without hand gestures—right brain		
12	• neat and organized—left brain • cluttered with old assignments—right brain		
13	• overall story—right brain • many specific details—left brain		
14	• sitting erect in a chair—left brain • walking around the room—right brain		
15	• quiet area—left brain • background music or sounds—right brain		
16	• solve the problem in an organized manner—left brain • find the answer without being able to explain how—right brain		

Some Types of Learners

Anh?

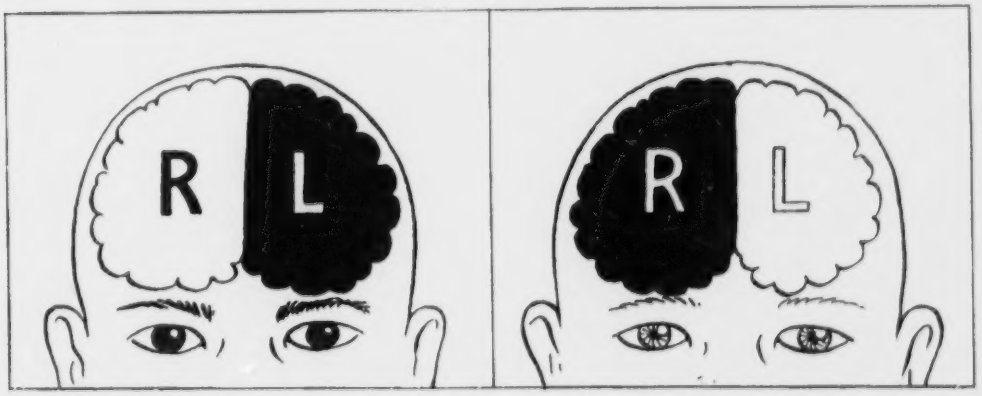
Celia?

Khim?

NOVA Activity **Secrets of the Mind**

There are many ways to learn; a few are described below. Read them and see whether any of them sound like some of the ways you think and learn.

Left-Brain Dominant	Right-Brain Dominant
1. **Verbal**—Uses words to give directions, describe places and define ideas. Prefers writing assignments to other options.	1. **Nonverbal**—Understands meaning of something, but has difficulty expressing it in words. May need additional time for writing assignments.
2. **Sequential**—Follows directions easily when things must be done in order. Is a list maker and strong in mathematics and spelling. Is aware of time and meets deadlines.	2. **Random**—Finds it difficult to stay on task. Needs to learn to make lists and assign priorities to tasks that need to be done. Lacks sense of time.
3. **Linear**—Takes small bits of information, puts them in a logical order and then draws conclusions. Is excellent in debates.	3. **Holistic**—Sees the big picture before the details. Needs to see a reason to do something. Will often write the outline after the paper is already written.
4. **Abstract**—Able to easily work with symbols, such as words, letters, and numbers. Shows ability in mathematics and vocabulary.	4. **Concrete**—Needs to have experiences with real applications, especially hands-on activities. Does mathematics problems in context.
5. **Logical**—Makes decisions based on logic or known information.	5. **Intuitive**—Responds to emotion or hunches, based on incomplete information.
6. **Planner**—Looks to the future and makes necessary arrangements.	6. **Spontaneous**—Makes plans by the moment.



Activity Answer

Though both sides of the brain work together, each of the different hemispheres process information differently and seems to have a different function. Most people seem to have a side that is dominant. While the left side of the brain processes written and verbal information, usually focusing on the details, the right side of the brain is said to interpret information visually, emotionally, and in a more global manner. The right side of the brain focuses on the big picture, while the left brain focuses on the parts. To get the most from their brains, students need to be aware of and use both sides. Since classroom lessons are usually geared to the left side of the brain, it might take a special effort for some students to develop the strengths of the right side of the brain.

Resources

Books

Ramachandran, V. S., and Sandra Blakeslee.
Phantoms in the Brain: Probing the Mysteries of the Human Mind.
New York: William Morrow and Company, 1998
Relates stories of people who have unusual neurological conditions. Each chapter describes a particular problem, then follows with ideas about the underlying cause of the disorder.

Springer, Sally.
Left Brain, Right Brain.
New York: W.H. Freeman and Company, 1997.
Describes historical and current research into the workings and functions of the two hemispheres of the brain.

Article

Jansen, Eric.
"How Julie's Brain Learns."
Educational Leadership, November 1998, v. 56, Issue 3, p. 41.
Offers a range of articles on topics from the need for educators to develop a functional understanding of the brain and its processes, to curriculum development that builds on the way the brain constructs knowledge, and how the brain's learning process connects with classroom learning. Includes an annotated bibliography and list of Web sites.

Web Sites

NOVA Online—Secrets of the Mind
www.pbs.org/nova/mind/
On this Web site, play tricks on your own mind with a series of visual experiments, read the eerie tales of phantom-limb sufferers, find out how the brain works, and probe a virtual brain to explore its motor cortex.

Neuroscience for Kids
faculty.washington.edu/chudler/neurok.html
Provides information and activities to learn more about the nervous system, including the anatomical structure of the brain, how the brain works, and left- and right-brain hemispheres.

Program Contents

Scientists present a wide variety of evidence, and its interpretation over time, in an ongoing debate over Neanderthals' place in evolution.

The program:

- describes the changing view of Neanderthals over the last 150 years and illustrates the different interpretations that scientists have held over this time period.
- follows the debate of whether Neanderthals were ancestors of *Homo sapiens*, or the result of a separate evolutionary path.
- documents an analysis of Neanderthal DNA, which supports the idea that Neanderthals were not direct ancestors of modern humans.
- introduces arguments from those who believe that Neanderthals and moderns were separate species and could not interbreed, making Neanderthals an evolutionary dead end; and those who believe that Neanderthals and moderns were members of a single species that did interbreed, giving Neanderthals a role in the ancestry of modern humans.
- illustrates the subjective nature of interpreting archaeological sites by detailing the errors of past interpretations of artifacts found in a French cave.
- reveals modern excavation techniques of the French cave site and interpretations of the artifacts there.

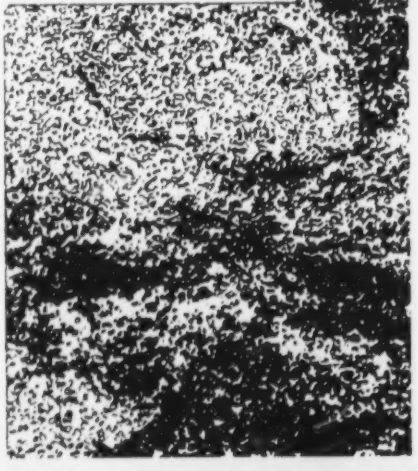
Before Watching

1. The illustration below left, published in 1909, represents one of the first depictions of Neanderthals. The photograph on the right represents a modern interpretation. Before showing the program, display both depictions of Neanderthals and ask students to draw conclusions about the subject pictured in each.

What conclusions would you draw about each of these individuals?

After Watching

1. Have students look again at the two depictions of the Neanderthals. What differences do they see in how the Neanderthals are represented? How have the representations changed? What might account for these differences?



Activity Setup

Objective

To interpret a Neanderthal artifact found at a cave site in Slovenia

Materials for each student

- copy of the *What Is This?* activity sheet on page 22

Procedure

1. Tell students that there is still much to be learned about Neanderthal life. Increasing evidence points to the idea that Neanderthals may have been more sophisticated than previously thought.
2. In this activity, students will be looking at and trying to determine the nature of an illustration of an artifact discovered in 1996 at a Neanderthal camp in Slovenia. The actual artifact was about 4.3 inches (11 centimeters) long.
3. Organize students into groups and distribute a copy of the *What Is This?* activity sheet to each student. Have students read the information provided about Neanderthal life and brainstorm what they believe the artifact might be. Have students defend their reasoning.
4. Once students are finished, have each group present its conclusions about the artifact to the class. Make a chart of students' ideas and then discuss other possibilities for what the artifact might be. After all ideas are presented, have each group decide whether it still supports its original conclusions, citing why or why not. What additional information would students need to help them identify the object?
5. At the end of the activity, tell students that when this was originally found, some scientists believed it was a flute made by the Neanderthals. Most scientists now believe that the artifact is actually a bone that has been pierced by the canine teeth of a predator.

Standards Connection

The activity found on page 22 aligns with the following *National Science Education Standards*.

Grades 5-8

Science Standard G:
History and Nature of Science

Nature of science

- It is part of scientific inquiry to evaluate the results of scientific investigations, experiments, observations, theoretical models, and the explanations proposed by other scientists. Evaluation includes reviewing the experimental procedures, examining the evidence, and identifying faulty reasoning, pointing out statements that go beyond the evidence, and suggesting alternative explanations for the same observations. Although scientists may disagree about explanations of phenomena, about interpretations of data, or about the value of rival theories, they do agree that questioning, response to criticism, and open communication are integral to the process of science. As scientific knowledge evolves, major disagreements are eventually resolved through such interactions between scientists.

Grades 9-12

Science Standard G:
History and Nature of Science

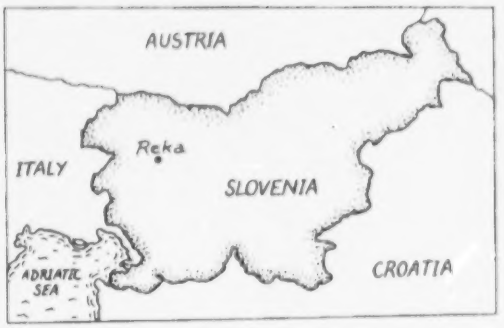
Nature of scientific knowledge

- Scientific explanations must meet certain criteria. First and foremost, they must be consistent with experimental and observational evidence about nature, and must make accurate predictions, when appropriate, about systems being studied. They should also be logical, respect the rules of evidence, be open to criticism, report methods and procedures, and make knowledge public. Explanations on how the natural world changes based on myths, personal beliefs, religious values, mystical inspiration, superstition, or authority may be personally useful and socially relevant, but they are not scientific.

What is This?

NOVA Activity **Neanderthals on Trial**

The artifact at the bottom of the page was discovered in a cave in western Slovenia. It is believed to be between 43,000 and 82,000 years old and determined to be from the thighbone of a juvenile cave bear. It was found at a former Neanderthal camp known as Divje Babe I near the town of Reka. But what is this artifact? What, if anything, was it used for? Use the information about Neanderthal life below to see whether you can figure out what this artifact might be.



Neanderthal Life

Who were the Neanderthals, the *hominids* that existed before and during part of the same time as modern *Homo sapiens*? While scholars disagree about exactly who the Neanderthals were, they have some idea of how they lived from sites that have been excavated in Europe and Western Asia. The Neanderthals lived from about 200,000 years ago to around 30,000 years ago, during the Ice Age.

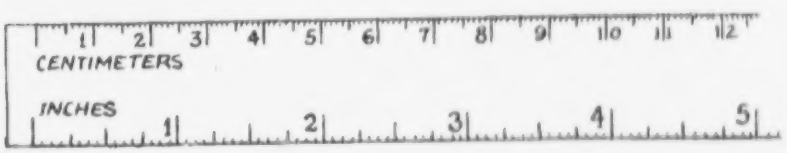
They made tools from stone gathered nearby their camps and presumably used them for such things as shaping wood, butchering animals, and scraping hides. They lived in caves, rock shelters, and open-air sites. They used fire. There is only limited evidence of artistic expression. A few pierced animal teeth have been found, probably worn as personal adornment, but no cave paintings or figurative carvings on bone or stone have been found. There is no way of knowing, however, whether their artistic talents took another form that would not be preserved, such as wood carving or storytelling.

In terms of diet, they subsisted on meat from hunting small game and herd animals such as wild horses, deer, and caribou. Larger and more dangerous animals such as mammoths and bears were either ambushed or trapped, or—more likely—scavenged after another predator had killed them. They also ate plant foods, although little of the evidence for this aspect of their diet has survived. The question of whether Neanderthals deliberately buried their dead, as opposed to merely disposing of bodies in trash heaps at their living sites, is still controversial. There is good evidence from at least one site that they cared for disabled individuals.

Questions

Write your answers on a separate sheet of paper.

1. What do you think this object is? What might it have been used for? What level of confidence do you have in your conclusion? Defend your reasoning.
2. What else could this be?
3. What other information would you want to get to help you figure out what this might be?



Activity Answer

Neanderthals were named after Neander Valley, the German valley in which their remains were first discovered. They have been classified both as part of the same species to which contemporary humans belong (*Homo sapiens*) and as a separate species only distantly related to modern humans.

Ideas about the nature of Neanderthals have often been at extremes, either that they were of limited intelligence, and not in any way related to contemporary humans, or that they were smart, and very much like contemporary humans. One of the challenges for anthropologists today is to try to understand the Neanderthals as they truly were.

In paleoanthropology, as in the other historical sciences, scientists create theories from fragmentary evidence; if those theories can't be disproved, they are considered valid interpretations of the past until further evidence invalidates them.

In the case of the item students were interpreting, some scientists believed the artifact was a flute, supporting the idea that Neanderthals exhibited artistic expression. However, all Neanderthal finds to date suggest that Neanderthals neither had the bone-working technology to make such an item, nor any hint of artistic behavior that would be the source of such an instrument, evidence that refutes the flute theory. Some scientists theorize that the holes instead were made by a carnivore puncturing the bone with its canine teeth.

Resources

Books

Shreeve, James.
The Neandertal Enigma: Solving the Mystery of Modern Human Origins.
New York: Willam Morrow & Co Inc., 1996.
Examines the scientific evidence and controversy surrouding the fate of Neanderthals.

Tattersall, Ian.
The Last Neanderthal: The Rise, Success, and Mysterious Extinction of Our Closest Human Relatives.
Boulder, CO: Westview Press, 1999.
Uses recent discoveries to explain why Neanderthals continue to be so perplexing a scientific mystery.

Trinkaus, Erik, and Pat Shipman.
The Neanderthals: Changing the Image of Mankind.
First edition. New York: Knopf, 1993.
Reveals how the personal philosophies of scientists and the cultural ethos in which they lived combined to determine their view of prehistoric humans.

Article

Bower, Bruce.
"Doubts Aired Over Neanderthal Bone 'Flute.'"
Science News, April 4, 1998, page 215.
Summarizes findings from two scientists who believe that the Neanderthal cave bear thigh bone is not a flute, but rather a bone that appears to have been punctured and gnawed by carnivores.

Web Sites

NOVA Online—Neanderthals on Trial
www.pbs.org/nova/neanderthals/
On this Web site, read a NOVA producer's account of making a balanced film on a contentious issue, compare Neanderthal and Cro-Magnon skulls, learn how experts trace ancestry using a type of DNA only passed down along maternal lines, and get a taste of interpreting bones and artifacts.

Scientific American—The Last Neanderthal
www.sciam.com/explorations/1999/110899nean/index.html
Reports on some of the changing views about Neanderthals.

Life's Greatest Miracle

Airs the week of November 20 • www.pbs.org/nova/miracle/

Program Contents

NOVA explores reproduction with a microscopic view of conception and development of a new human life.

The program:

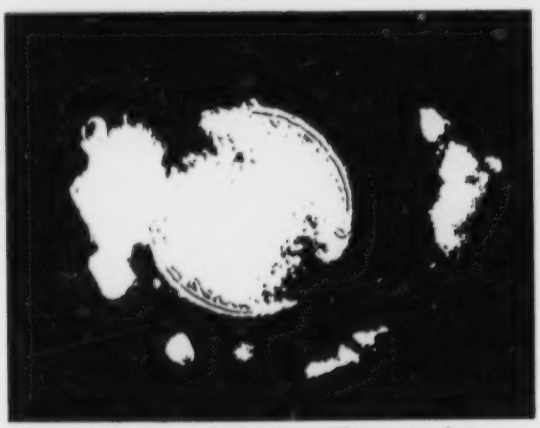
- explains sexual and asexual reproduction.
- discusses the importance of the mating rituals of humans and other species, explaining the evolutionary benefits of sexual reproduction in creating variation and improving a species' survival rate.
- explores the function of deoxyribonucleic acid (DNA) in carrying human genetic information.
- describes the human reproductive systems.
- traces the journey of sperm from the time it enters the female body to when it fertilizes the egg.
- presents the earliest stages of development of the embryo, using time-lapse microphotography to show the divisions of cells.
- documents the development of the embryo into a fetus, highlighting the growth and formation of vital organs, body parts, and senses.
- concludes with the birth of a child.

Note: This program contains graphic images. Please preview the program to determine its appropriateness for your classroom.

Before Watching

1. Review the male and female human reproductive systems with students and examine how the systems function.

2. As students watch, have them take notes on which systems and body parts develop in each phase of the developmental process.



The number of eggs a woman has, from millions present just before birth to a few hundred thousand before the onset of puberty, rapidly depletes as she ages.

After Watching

1. Draw a 40-week timeline on the chalkboard. Ask volunteers to fill in the timeline using their notes about each stage of embryonic/fetal development.

2. Genetic and environmental factors influence both male and female reproductive systems. Have students brainstorm some of the positive and negative environmental influences on sperm production and pregnancy, including nutrition, exercise, and exposure to chemicals.

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Activity Setup

Objective

To identify the effects of maternal consumption of alcohol at various stages of pregnancy.

Materials for each student

- copy of the *Developmental Chart* activity sheet on page 26
- copy of the *Fetal Alcohol Syndrome Facts* activity sheet on page 27

Materials for each group

- copies of the *Case Studies* activity sheet on page 28
- access to print and Internet resources

Procedure

Part I

1. Discuss with students the idea that a developing embryo needs a certain environment to evolve into a healthy fetus and healthy baby. It requires the proper nutrients and care to develop without incident. Tell students that in this activity, they will review the developmental process and the effect one chemical—alcohol—can have on that process.
2. Read the activity sheets to familiarize yourself with the steps students will take. Distribute copies of the *Developmental Chart* activity sheet. With students, review the developmental stages shown. (If students have seen the program, you may want to have them augment this chart with information from the show.)
3. Distribute copies of the *Fetal Alcohol Syndrome Facts* activity sheet.
4. Discuss elements of Fetal Alcohol Syndrome (FAS), and Fetal Alcohol Effect (FAE) (See *Activity Answer* on page 29 for more information.) Make clear to students that there may be varying degrees of FAS and FAE. Diagnosis may be easy in severe cases and difficult in less severe cases.
5. Have students use the *Developmental Chart* and *Fetal Alcohol Syndrome Facts* activity sheets to answer the questions on the *Fetal Alcohol Syndrome Facts* activity sheet. Have them also discuss the impact of maternal alcohol consumption during the first, second, and third trimesters on facial features, brain development, and growth.

Part II

1. Organize students into groups. Distribute the *Case Studies* activity sheet. Advise them that they will be playing the part of adoption counselors. Each group will focus on one of the four case studies.
2. Have students gather additional information for their case studies from print and Internet resources.
3. Ask each group to present its case information and concerns about the case to the class.
4. As an *extension*, have students explore the effects of prenatal maternal smoking or drug use on embryonic and fetal development and growth.

Standards Connection

The activity found on pages 26–28 aligns with the following *National Science Education Standards*.

Grades 5-8

Science Standard C:
Life Science

Structure and function in living systems

- Cells carry on the many functions needed to sustain life. They grow and divide, thereby producing more cells. This requires they take in nutrients, which they use to provide energy for the work that cells do and to make the materials that a cell or an organism needs.

Science Standard F:
Science in Personal and Social Perspectives

Personal health

- Alcohol and other drugs are often abused substances. Such drugs change how the body functions and can lead to addiction.

Grades 9-12

Science Standard C:
Life Science

The cell

- Cells can differentiate, and complex multicellular organisms are formed as a highly organized arrangement of differentiated cells. In the development of these multicellular organisms, the progeny from a single cell form an embryo in which the cells multiply and differentiate to form the many specialized cells, tissues, and organs that comprise the final organism.

Science Standard F:
Science in Personal and Social Perspectives

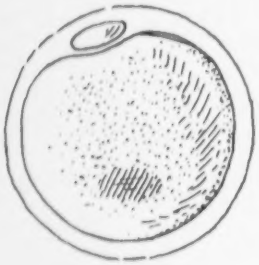
Personal and community health

- An individual's mood and behavior may be modified by substances. The modification may be beneficial or detrimental depending on the motives, type of substance, duration of use, pattern of use, level of influence, and short- and long-term effects.

Developmental Chart

NOVA Activity **Life's Greatest Miracle**

Human pregnancy lasts approximately 40 weeks. It can last anytime between 36 and 42 weeks after fertilization and still be considered a normal timeframe.



1 Day Post-ovulation

4 weeks

8 weeks

First Trimester

An egg becomes fertilized when a sperm penetrates it, creating a zygote. For the first eight weeks, the developing baby is called an embryo. It looks like a tadpole. At about three weeks, the neural tube, which becomes the brain and spinal cord, is forming. At about four weeks, the heart begins to pump blood. Tiny limb buds appear, ankles and wrists are formed, and fingers and toes develop. During the first trimester, which lasts up to 10 weeks, all major body organs and systems are formed but not completely developed. This is a critical period for development of the heart, central nervous system, upper and lower limbs, eyes and ears, teeth and palate, and most organs. Any damage at this stage can result in major damage or deformity. At eight weeks, when most organs have formed, the embryo is called a fetus.

Second Trimester

The fetus moves, kicks, swallows, and can hear the mother's voice. It begins to wake and sleep at regular intervals. The skin changes from a transparent pink to a wrinkled red, and is covered with soft, fine hair. By the end of the fourth month, the central nervous system is past its most vulnerable stage. As its development continues, though, it remains susceptible to functional defects throughout pregnancy. The eyes, teeth, and external genitalia continue to be susceptible to functional defects and lesser deformities throughout the second trimester, which lasts until about Week 30.

Third Trimester

Body growth slows down, while brain growth continues and the head grows larger during the third trimester. The fetus begins developing its own immune system. Rapid brain growth continues. The fetus can open and close its eyes, suck its thumb, kick, stretch, and cry. It responds to light and sound and, if born as early as the seventh month, would have a good chance of surviving.

Fetal Alcohol Syndrome Facts

NOVA Activity **Life's Greatest Miracle**

Drinking alcohol during pregnancy can cause Fetal Alcohol Syndrome (FAS) and Fetal Alcohol Effect (FAE). When a pregnant woman drinks alcohol, the developing embryo and fetus drinks, too. Because of its relative size to the mother and because it metabolizes alcohol more slowly than the adult mother, the developing embryo and fetus experiences higher levels of alcohol concentration. The U.S. Public Health Service has indicated that there is no safe level of alcohol use during pregnancy.

FAS is a cluster of related conditions. FAS includes:

- facial abnormalities (such as small eyelid openings, short nose, flat mid-face)
- poor coordination
- poor growth
- hyperactive behavior
- learning disabilities
- developmental disabilities
- mental retardation or low IQ

Some babies are diagnosed with FAS. Others have only some of the symptoms, a condition known as Fetal Alcohol Effect.

Questions

Write your answers on a separate sheet of paper.

1. Would binge drinking once or twice a week be more likely to affect facial features during the first, second, or third trimester of pregnancy? Explain your answer.
2. If a pregnant woman drinks two glasses of wine every day during her third trimester, would that be more likely to affect development of facial features or brain function? Explain why.
3. If a nursing mother continues to drink heavily, could her drinking continue to affect the baby's growth? Facial features? Brain development? Explain your answer.

Case Studies

NOVA Activity **Life's Greatest Miracle**

You are an adoption counselor for high-risk babies. You will be given one of the following four case studies to review. Your job is to review your case, perform any additional research you think is necessary, and then write a short summary citing your concerns for each of these newborns.

Adam—Adam's mother is 35 years old. She drank heavily throughout the first seven weeks of her pregnancy, not knowing that she was pregnant. When she discovered that she was pregnant, she stopped drinking entirely for three weeks, then slowly resumed. During the last two trimesters, she alternated between binge drinking and periods of sobriety.

Barbie—Barbie's mother is 20 years old. She has a history of heavy drinking, and was still drinking heavily during the first three weeks of pregnancy. When she realized she was pregnant, she entered a residential treatment program and joined AA. She has not had a drink since that time.

Carlos—Carlos's mother is 19 years old. Throughout her pregnancy, she drank on weekends. While she got drunk once or twice, she usually just drank a six-pack of beer over the course of the weekend.

Danielle—Danielle's mother is 25 years old. She insists she does not have a drinking problem. She has two or three drinks each evening. She maintained this pattern throughout her pregnancy.

Activity Answer

Embryonic development begins with simple cell division and proceeds through cell differentiation, morphogenesis, and growth.

Drinking alcohol can have adverse effects on a developing embryo, including Fetal Alcohol Syndrome (FAS) and Fetal Alcohol Effect (FAE). According to the Centers for Disease Control and Prevention, FAS is "a disorder characterized by growth retardation, facial abnormalities, and central nervous system dysfunction." FAE is characterized by a less severe set of these symptoms. FAS and FAE are irreversible, lifelong conditions.

In cases of FAS, heavy drinking during the early weeks of pregnancy is most likely to cause the classic FAS facial features, which include a flattened filtrum (the area between the lip and the nose), small, widely-spaced eyes, a thin upper lip, and a short, upturned nose. Drinking later in pregnancy will affect the growth of the fetus and the development of the central nervous system.

All drinks containing alcohol can harm an unborn embryo or fetus. Factors that affect the severity of FAS include genetic variations, the amount and the timing of drinking during pregnancy, and the use of other drugs.

FAS is a syndrome of related symptoms. It is not possible to predict which of them will occur in a particular child. Some of the concerns might be:

Adam—Because Adam's mother drank heavily early in pregnancy and continued frequent binge drinking, Adam has a higher probability of having FAS than of a newborn whose mother did not drink, including the facial features, small head size, growth and behavioral problems, and mental retardation.

Barbie—Barbie's mother stopped drinking, but damage may already have been done during the first three weeks of her pregnancy, especially since her drinking during that time was heavy.

Carlos—Because Carlos's mother did not drink heavily, he may escape having FAS. He may still suffer some effects from her drinking, which could lead to a diagnosis of FAE.

Danielle—Like Carlos, Danielle is less likely to suffer from FAS. She may experience growth or behavioral problems, but is not likely to have the small head size and distinctive facial features associated with FAS.

When Talking About FAS and FAE

Some students may be affected to varying degrees by familial experience of alcoholism. All students may know people for whom these are daily life issues. Try to be sensitive to students' feelings by keeping discussion theoretical and general, rather than personal. Remind students that not every child of an alcoholic mother is born with FAS or FAE. The March of Dimes estimates that each year about 50,000 babies born in the United States have some degree of alcohol-related damage.

Resources

Book

Dorris, Michael.
The Broken Cord: A Family's Ongoing Struggle With Fetal Alcohol Syndrome.
New York: HarperCollins (paperback), 1990.
Recounts an adoptive father's experience of living with an FAS child.

Web Sites

NOVA Online—Life's Greatest Miracle
www.pbs.org/nova/miracle/
On this Web site, join a debate between two scientists about using embryonic stem cells for research, learn the many ways doctors monitor a developing fetus, follow a woman in labor, see mitosis and meiosis in action, and follow the cellular growth of sex determination.

CDC—Fetal Alcohol Syndrome
www.cdc.gov/ncbddd/fas/
Summarizes basic information about FAS.

March of Dimes: Drinking During Pregnancy
www.modimes.org/HealthLibrary2/factsheets/Drinking_during_pregnancy.htm
Provides a comprehensive overview of the effects of alcohol use during pregnancy, with links to related sites on the effects of smoking and cocaine use and to additional information on all types of birth defects.

The Visible Embryo
www.visembryo.com/baby/index.html
Features a spiral showing week-by-week development, and includes online games related to conception and fetal development.

Methuselah Tree

Airs the week of December 11 • www.pbs.org/nova/methuselah/

Program Contents

The discovery and analysis of a bristlecone pine tree that is more than 4,600 years old has provided scientists with an accurate and precise means of analyzing historical climate data.

The program:

- highlights Edmund Schulman's 1957 discovery of the world's oldest living tree, Methuselah, which resides in the Inyo National Forest in the California White Mountains.
- explains the process of tree-ring analysis, which in some cases can be a more accurate method than radiocarbon dating.
- describes how the exact year of climatic events can be pinpointed from the evidence found in tree rings, such as an abnormally cold summer in 1628 B.C.
- shows how Methuselah lived through and adapted to a harsh and changing environment that included human settlement, silver mining, and nuclear bomb testing.
- takes the point of view of the tree in chronicling its history
- raises questions about whether bristlecone pines might hold the secret to extreme longevity, based on evidence that 100 percent of Methuselah seedlings germinated

Before Watching

1. Ask students what they think the oldest living organism might be. An animal? A plant? Have students defend their reasoning. What characteristics would this organism have? What kind of habitat might it live in?

2. As students watch, have them take notes on the environment the Methuselah tree lives in.

The Methuselah Tree is the oldest living organism known on Earth.

After Watching

1. Have students return to their notes about the environment found in the White Mountains. How many of their predictions about an environment for the longest living organism were true? What might be some of the advantages to living in a harsh environment? What other kinds of plants live in harsh climates?

2. To help students gain perspective about Earth's history, have them create a timeline and note when such events as when the first life on Earth appeared, the Ice Age, the first modern humans, when the Methuselah tree was born, and when the modern world began. What do they notice about the evolution of Earth's 5-billion-year history?

Activity Setup

Objective

To learn how scientists determine the age of living and non-living trees.

Materials for each student

- 2 copies of the *Tree-Ring Science* activity sheet on page 32
- 1 sheet of blank paper
- scissors
- tape

Procedure

1. Tell students they will be taking on the role of a *dendrochronologist*, a tree-ring scientist. Provide each student with two copies of the *Tree-Ring Science* activity sheet.
2. Students will be crossdating tree-ring samples to determine which sample is oldest, and will then determine the age of the oldest sample. This works by comparing the patterns in the tree-ring samples obtained from trees in the same region that have experienced similar weather conditions.
3. Have students cut out the samples and study them carefully for patterns. Make sure students understand how to identify a tree ring.
4. Have students start with the living tree sample and match any portion of its rings with one of the other samples. Have them continue that process until all the samples are used. Then have them count back from the living sample to the end of the last sample to determine the age of the oldest specimen in the group. (See *Activity Answer* on page 33 for an example.)
5. The technique in this activity is a simplified representation of how dendrochronologists date trees. Inform students that the samples they are looking at represent young trees from the same area with no abnormalities. Usually, dendrochronologists use older trees and many more samples to ensure that the crossdating is correct.
6. As an *extension*, have students explore other ways that scientists study core samples to learn about past climates, including soil cores, ice cores, and coral reef cores.

Standards Connection

The activity found on page 32 aligns with the following *National Science Education Standards*.

Grades 5-8

Science Standard C:
Life Science

Structure and function in living systems

- Cells carry on the many functions needed to sustain life. They grow and divide, thereby producing more cells. This requires that they take in nutrients, which they use to provide energy for the work that cells do and to make the materials that a cell or an organism needs.

Grades 9-12

Science Standard C:
Life Science

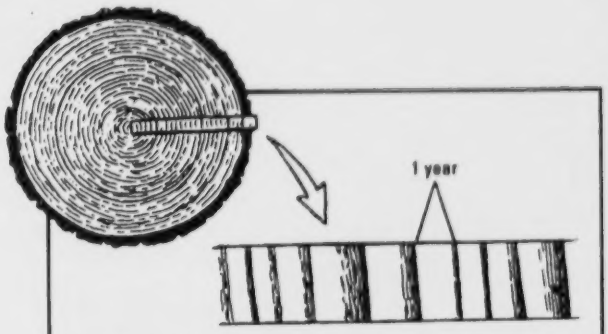
The cell

- Plant cells contain chloroplasts, the site of photosynthesis. Plants and many microorganisms use solar energy to combine molecules of carbon dioxide and water into complex, energy rich organic compounds and release oxygen to the environment. This process of photosynthesis provided a vital connection between the sun and the energy needs of living systems.

Tree-Ring Science

NOVA Activity **Methuselah Tree**

Have you ever looked at a tree outside your house and wondered when it started growing? You can't tell how old it is just from looking at it, but you can tell from samples taken from within the tree. In this activity, you will analyze tree ring samples—all from the same area—and determine the age of the oldest sample.

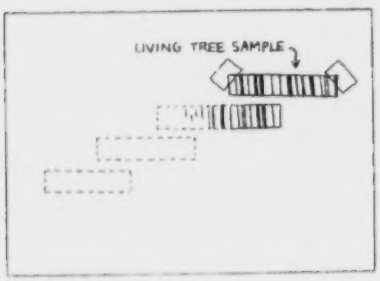


Tree Rings
Trees start out small, and each year, they grow by one ring. By counting the rings from the middle of the trunk out to the end, a scientist can tell how old a tree is. One tree ring is added each year.

Procedure

① On the copy of this activity sheet, cut out each of the four tree-ring samples.

② Orient your blank sheet of paper horizontally. Tape the live tree sample in the upper right-hand corner.



③ Now find the sample that matches part of the living tree sample. Line that up correctly and tape that sample down. Work from the top right-hand corner of the page to the bottom left-hand corner. Continue this process until you have used all the samples.

④ Now count how many rings there are total, making sure to count the overlapped regions only once.

Questions

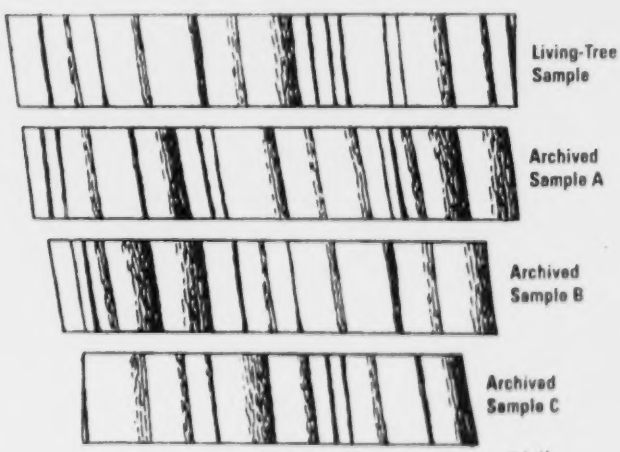
Write your answers on a separate sheet of paper.

① If the living tree is 15 years old, how old is the oldest tree in your sample set?

② Predict why some rings are bigger and others smaller.

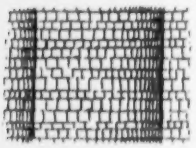
③ Your samples represent trees with normal growth years. What are some factors that might contribute to abnormal growth?

④ You looked at four samples, but scientists who study tree rings use many samples from the same area. Why might this be?



Activity Answer

The Methuselah Tree has lived more than 4,600 years. The tree rings on Methuselah and other trees result from the annual growth cycle.



Large cells, made during the spring when rain is abundant, mark the start of a tree ring. As the seasons continue, growth slows and then finally stops until the following spring. A continuum of cell growth size can therefore be seen for each year.

The sizes of each ring depend on many factors, including location, temperature, soil condition, wind, snow accumulation, sunlight, land gradient, and tree physiology. In addition, ring growth is not always annual, so a ring may be absent from a core sample. These are some reasons why scientists can't rely solely on counting rings and must use crossdating from multiple samples to ensure accurate age determination.

The correct tree sample lineage for the activity is:

The age of the oldest tree in the sample is 35.

The bristlecone pine chronology done in the southwest United States stretches back more than 8,500 years; the European oak and pine chronology goes back more than 11,000 years.

Besides dating trees and revealing past climate data, dendrochronology is used to provide information about glacial activity, volcanic events, and even past insect outbreaks. You may want to tell students that scientists rarely cut down the trees they research. Instead, they drill a core sample, about the width of a pencil, through the tree.

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Resources

Books

Schweingruber, Fritz H.
Tree Rings: Basics and Applications of Dendrochronology.
Dordrecht, The Netherlands: D. Reidel Publishing Co., 1987.
Covers all topics related to dendrochronology.

Stokes, Marvin A. and Terah L. Smiley.
An Introduction to Tree Ring Dating.
Chicago, IL: The University of Chicago Press, 1968. Republished by The University of Arizona Press, 1996.
Provides basic dendrochronology information.

Web Sites

NOVA Online—Methuselah Tree
www.pbs.org/nova/methuselah/
On this Web site, look at Methuselah and other bristlecone pines using QuickTime VR, learn how scientists date trees, discover the nature of longevity, and find out how photosynthesis occurs.

The Ancient Bristlecone Pine
www.sonic.net/bristlecone/intro.html
Shows how and where these bristlecone pines were found, and tells about their unique strategies for survival.

Crossdating Tree Rings Using Skeleton Plotting
tree.ltrr.arizona.edu/skeletonplot/introcrossdate.htm
Presents information on how to create skeleton plots.

Majestic Trees of America Timeline
www.arborday.org/trees/majTreesTimeline.html
Highlights some tree-related milestones from 2000 B.C., around when the oldest living tree was born, to 2001 A.D., the year America voted for a National Tree.

Ultimate Tree-Ring Web Pages
web.utk.edu/~grissino/
Provides comprehensive information about dendrochronology and links to a wide range of dendrochronology resources.

Flying Casanovas

Airs the week of December 25 • www.pbs.org/nova/bowerbirds/

Program Contents

NOVA follows David Attenborough through the forests of Australia and New Guinea, tracking and observing the unique mating practices of male bowerbirds, which arrange inanimate objects and build intricate structures to attract females.

The program:

- shows how bowerbirds build a bower by gathering and arranging leaves, twigs, insect leaves, feathers, flowers, and other objects, and how they behave in the presence of a female.
- documents the wide variety of bower-building practices, from simple arrangements of leaves to elaborate decorative displays and enormous structures.
- presents several instances of mating behavior, in which the female approaches and inspects the bower, and the male sings and displays his plumage and treasures.
- captures footage of thievery and vandalism by rival bowerbirds possibly attempting to detract from the appearance of their neighbors' bowers.
- raises questions about the possibility that these birds possess a true artistic and aesthetic sense, based on their apparent care and deliberation in building their bowers.

Before Watching

1. Remind students that behaviors are one type of adaptation. The bowerbird's behavior is determined in part by heredity and in part by experience. As students watch, have them take notes about how bowerbirds constructed their bowers. How were they built and decorated? How does the male try to make his bower appealing to the female?

The Fawn-breasted Bowerbird, *Chlamydera cerviniventris*, is one of many species of bowerbird found in Australia and New Guinea.

After Watching

1. Have students list some of the things that the birds did to attract mates. What were the behaviors and the speculations about them? How would students devise additional experiments to verify or refute the speculations?

2. Many other animals also use many different ways to attract mates. What are some ways that other animals try to attract mates? What about people? Why might animals or people choose certain ways to court a mate?

Activity Setup

Objective

To compare and contrast various styles of bowers created by bowerbirds.

Materials for each student

- copy of the *Bowerbird Basics* activity sheet on page 36

Procedure

1. Organize students into teams of two. Assign each team to track one of the following types of bowerbirds (some teams may be tracking the same bird):

   a. Western Bowerbird
   b. Tooth-billed Bowerbird
   c. Archbold's Bowerbird
   d. McGregor's Bowerbird
   e. Golden Bowerbird
   f. Vogelkop Bowerbird
   g. Regent Bowerbird
   h. Satin Bowerbird
   i. Great Bowerbird

2. Provide each student with a copy of the *Bowerbird Basics* activity sheet. Have each team decide which member will record a visual representation of its assigned bowerbird's bower and which will journal the characteristics of the assigned bower.

3. Once roles are assigned, have students watch the program, taking notes on their assigned characteristics. Students should note variations of bowers of their assigned species.

4. Following the program, have members of each team compare their visual and written records of their assigned bower and reconcile any differences. Then have three teams combine to form a new group and compare bowers. Have the new group answer *Questions for Combined Teams*.

5. After all groups have answered their questions, hold a class discussion on the characteristics of all the bowerbirds featured in the program and determine the similarities and differences among them. Discuss each of the following points and any other student observations when analyzing all the bowers:

   - How do the bowers compare in terms of simplicity versus complexity?
   - How do the items chosen by each species compare and contrast?
   - What might be some reasons for these similarities and differences?
   - What behaviors did the male bowerbirds exhibit that might have been designed to increase their chances of being selected by the females?

6. As an *extension*, have students research ways other bird species display mating behavior.

Standards Connection

The activity found on page 36 aligns with the following *National Science Education Standards*.

Grades 5-8

Science Standard C:
Life Science

Regulation and behavior

- An organism's behavior evolves through adaptation to its environment. How a species moves, obtains food, reproduces, and responds to danger are based in the species' evolutionary history.

Grades 9-12

Science Standard C:
Life Science

The behavior of organisms

- Like other aspects of an organism's biology, behaviors have evolved through natural selection. Behaviors often have adaptive logic when viewed in terms of evolutionary principles.

Bowerbird Basics

NOVA Activity **Flying Casanovas**

Bowerbirds are the only species of bird that build structures, called *bowers*, to attract their mates. In this activity, you will explore some of the bowers that bowerbirds build.

Procedure

1. You will be assigned one of the following record-keeping roles:

   Notetaker: In the space below, write a description of your assigned bowerbird's bower, as well as any other information about the bird's characteristics or behaviors.

   Sketch Artist: In the space below, sketch your assigned bowerbird's bower, including as many materials as you can.

2. When your bowerbird is featured in the program, take notes or make sketches for your assigned role on all bower materials your species uses.
3. When the program is finished, compare visual and written records of your assigned bower and reconcile any differences.
4. Combine with two other teams to compare and contrast other bowers featured in the program.

Notes or Sketches

Questions for Combined Teams

Write your answers on a separate sheet of paper.

1. What did each species include in its bower?
2. What are the similarities among bowers? What are the differences?
3. Why might account for the items that were chosen?

Activity Answer

There are 17 bowerbird species known. They make up the family *Ptilonorhynchidae*, which, in turn, makes up the order *Passeriformes*.

	Type of bowerbird	Style of bower	Some of the materials used to decorate
a	Western Bowerbird	Two-walled Structure	Bones, snail shells, and pebbles—all white, twigs.
b	Tooth-billed Bowerbird	Mat or Platform	Leaves, all pale side up.
c	Archbold's Bowerbird	Mat or Platform	Moss, blueberries, dried orchid stems, beetle wing cases, head plumes of King of Saxony Bird of Paradise.
d	McGregor's Bowerbird	Maypole	Tree fern, twigs, caterpillar droppings, impacted moss, rare black fungus.
e	Golden Bowerbird	Twin Maypole	Twigs, fungus, horizontal branch, translucent seed pods, yellow lichen, jasmine flowers.
f	Vogelkop Bowerbird	Twin Maypole	Thatched roof of orchid stems, sapling base, twig pillars, black stems of tree ferns, moss lawn, beetle wing covers, orange fruit, glowing orange leaves, acorns, black fruits, bush flowers, brown fungus, brown leaves, blackberries, a large black mushroom.
g	Regent Bowerbird	Avenue	A leaf, a molted skin of a cicada.
h	Satin Bowerbird	Avenue (with walls)	Interwoven twigs , green leaves (chewed up and smeared on walls like paint), blueberries, green leaves or fruit, cicada skins, small skulls, leaf skeleton.
i	Great Bowerbird	Avenue	Marble chips, snail shells, beer bottle fragments, hair band, green foot powder packets, green water-bottle tops.

Similarities and differences include the simplicity or complexity of each bower, the size of each bower, and the materials used. Often, the more elaborate the bower, the less vivid the owner's plumage will be and vice versa. Some differences are a result of the materials available to each bower builder and how long the bower has existed. Some behaviors exhibited by bowerbirds were stealing items from or deconstructing other bowers, or singing songs to attract mates.

Resources

Book

Wechsler, Doug.
Bizarre Birds.
Honesdale, PA: Boyds Mills Press, 1999.
Investigates the fascinating and bizarre aspects of some of the 10,000 species of birds including physical traits, breeding, eating habits, and ability to fly.

Articles

Ryan, Michael J.
"Sexual Selection, Receiver Bias, and the Evolution of Sex Differences."
Science, September 25, 1998, p.1999.
Explores how sex differences in a species may evolve based on females' preferences for certain traits in males of that species.

Brownlee, Shannon.
"Of Males and Tails: Seeming Handicaps Tout a Suitor's Worth."
U.S. News & World Report, July 6, 1998, pages 60-62.
Reviews two different approaches to why females choose ornate males in sexual selection.

Web Sites

NOVA Online—Flying Casanovas
www.pbs.org/nova/bowerbirds/
On this Web site, read about bowerbirds from a scientist who has shadowed them for more than 10 years, learn the legends and lore of the birds, investigate the nature of courtship, and match bowerbirds to their proper bowers.

Birds—Everything About Bowerbirds
birding.miningco.com/hobbies/birding/msub1-bowerbirds.htm
Includes photos and information about habitat, nesting, and behavior of the Great Bowerbird, the Golden Bowerbird, and the Tooth-billed Bowerbird.

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This is not a complete listing of NOVA videos. Please call 1-800-949-8670 ext. 0400 for a free catalog.

These videos have been categorized by their primary content strand; many programs are interdisciplinary. You may want to scan several categories for videos of interest.

BOSTON VIDEO

Earth & Space Science

Adrift on the Gulf Stream

Explore the Stream's importance to ocean life, climate and human history. Writer Bill MacLeish travels its full course, sailing on top of it, diving under it and viewing its mighty swirl via satellites in space.
Educational use only. 1 hr. **WG1606* $19.95**

Aircraft Carrier!

Experience the grueling and intense life aboard the USS *Independence*, a floating airport with 5000 men and one mission: to provide a safe home base for American fighter planes during the Gulf War.
1 hr. **WGW2110 $19.95**

Apollo 13: To the Edge and Back

The gripping, true story of the catastrophic flight of the *Apollo 13* and the heroic struggle to bring the astronauts back alive. With first-hand accounts from the pilots, their families and the people of mission control, it documents a thrilling struggle against time and all odds and serves as a reminder that, in the words of James Lovell, "We do not realize what we have on Earth until we leave it."
1.5 hrs. **WG514 $19.95**

Avalanche!

With no warning and in mere seconds, avalanches wipe out everything in their paths, killing hundreds of people each year. Put yourself in the path of this terrifying force from the ski slopes of Montana to a village in Iceland, from Juneau, Alaska, to Switzerland's mountain roads—and see what risks scientists are taking to protect us.
1 hr. **WG2418N $19.95**

B-29 Frozen in Time

Join a grueling expedition to recover this rare WWII plane from the North Pole after 50 years—a trip which tests team members in ways they never imagined.
1 hr. **WG2303 $19.95**

Buried in Ash

Learn what life was like ten million years ago when a volcanic eruption buried much of what is now Nebraska in up to ten feet of ash.
1 hr. **WG2117* $19.95**

Chasing El Niño!

Lethal ice storms, droughts, floods and devastation—what in the world is going on here? *NOVA* explores the myths, reveals the devastation, explains the fascinating facts and provides a new climate for understanding the ultimate weather machine.
1 hr. **WG2512 $19.95**

Countdown to the Invisible Universe

Infrared telescopes unveil the outer regions of space.
1 hr. **WG1401 $19.95**

Cracking the Ice Age

The Himalayas, towering over the Tibetan plateau, are one of the world's most magnificent sights. But could they also be the cause of one of the planet's most dramatic climatic changes—the Ice Age? Take a trek to Tibet with a renegade band of researchers bent on proving this controversial concept. *Educational use only.*
1 hr. **WGZ320* $19.95**

Danger in the Jet Stream

Climb aboard and experience the exhilaration—and the terror—of trying to fly a balloon around the world.
1 hr. **WG2419* $19.95**

Daredevils of the Sky

Strap in for a ride with America's greatest stunt pilots! Stunning in-air photography puts you in the pilot's seat with the U.S. Aerobatic Team.
1 hr. **WGW2103 $19.95**

Deadly Shadow of Vesuvius

Scientists believe it's only a matter of time before Italy's Vesuvius erupts...again. Find out how science can help predict when Vesuvius will change from dormant to destructive.
1 hr. **WG2515 $19.95**

Death of a Star

Witness one of the most spectacular events since creation—the supernova. Go behind the supernova hysteria and learn why this phenomenon both baffles and delights astronomers.
1 hr. **WG1411 $19.95**

*No Retail Packaging

The Doomsday Asteroid

Join the hunt to scan the skies and earth for evidence that giant rocks from outer space have struck before and will strike again.
Educational use only. 1 hr. **WGDZ212* $19.95**

Earthquake

Predicting earthquakes is risky business, but *Earthquake* shows how today's advanced technology helps geologists interpret nature's rumblings. 1 hr. **WG1715* $19.95**

Eclipse of the Century

The race to view and study celestial splendor.
1 hr. **WG1910 $19.95**

Faster Than Sound

The international race to build an aircraft that could crack the sound barrier was fraught with danger, ambition and intrigue. *NOVA* tells the real story of those who risked all to make aviation history—including Chuck Yeager, who on October 14, 1947 was the first pilot to fly faster than sound.
1 hr. **WG2412 $19.95**

Flood!

Relive one of the greatest flood disasters—the Mississippi River in the summer of 1993—and explore the problem of taming the mightiest river.
1 hr. **WGZ307 $19.95**

Hawaii Born of Fire

Behold the fiery moonscapes and lush rain forests surrounding Hawaii's active volcanoes.
Educational use only. 1 hr. **WGH2211* $19.95**

Hunt for Alien Worlds

All eyes are on the heavens in search of planets around other stars, probably the best hope for showing that we may not be alone in the universe. *NOVA* covers an effort that is turning up more and more new worlds.
Educational use only. 1 hr. **WG2407* $19.95**

Journey to the Sacred Sea

Travel to Lake Baikal, the world's oldest and deepest lake, containing one-fifth of all the fresh water on Earth. Investigating Baikal from above, below and all around, *NOVA* charts its dramatically changing environment over the course of four seasons. *Educational use only.*
1 hr. **WG2119* $19.95**

The Light Stuff

Follow the symbolic recreation of the mythical flight of the human-powered plane *Daedalus 88* from prototype to its dramatic landing in the Mediterranean. *Educational use only.*
1 hr. **WGW711* $19.95**

Natural Disasters Boxed Set

Natural disasters strike with little or no warning—making them uniquely frightening and fascinating. Includes *The Day the Earth Shook, Tornado!*, and *In the Path of a Killer Volcano.*
3 hrs. on 3 cassettes. **WG165 $49.95**

Nature's Fury Boxed Set

Witness the awesome power of nature. Includes *Hurricane!, Lightning!* and *Killer Quake!*
3 hrs. on 3 cassettes. **WG027 $49.95**

Rescue Mission in Space

Travel into space for the dramatic space repair of the Hubble Telescope and view the stunning images of space the Hubble now produces.
1 hr. **WG2118 $19.95**

Runaway Universe

With the use of stunning three-dimensional cosmic simulations captured with revolutionary high-definition technology, *NOVA* presents the first attempt to explore the riddle of "dark energy"—the mysterious repulsive force that some scientists believe counteracts gravity. *Runaway Universe* presents the dramatic quest to unlock secrets of the stars as two rival teams search for exploding stars, map gigantic cosmic patterns of galaxies, and grapple with the ultimate question: what is the fate of the universe? 1 hr. **WG2713 $19.95**

NEW! Russia's Nuclear Warriors

NOVA takes an intimate look at the men who are in control of Russia's nuclear missiles, standing just a heartbeat from the top Russian politicians and Armageddon. Hosted by Vladimir Pozner, Russia's top television journalist, this startling film shows that despite low pay and the tedious existence that these soldiers and their families live with, these men are motivated by a strong sense of patriotic duty and responsibility for the ultimate powers of destruction at their fingertips, in a job that requires complete perfection. 1 hr. **WG35113 $19.95**

Space Explorers Boxed Set

Step on the moon. Float in space. Explore the final frontier. *NOVA* assembles three of its most acclaimed space adventures to create this special four-hour set. Includes *To the Moon, Terror in Space* and *Rescue Mission in Space.* 4 hrs. on 3 cassettes. **WG667 $49.95**

Stationed in the Stars

Go inside the planning, assembly and excitement of history's most ambitious and expensive engineering venture—a hugely ambitious "orbiting city" set for completion in 2004.
Educational use only. 1 hr. **WG2708 $19.95**

Supersonic Spies

This true tale of Cold War espionage reveals what really happened at the 1973 Paris air show, a supersonic competition between Soviet and French planes, when the *Konkordski* went down in a fatal, fiery explosion, never fully explained by either the French or Soviets.
1 hr. **WG2503 $19.95**

Terror in Space

Through candid interviews and spectacular previously unreleased footage, *NOVA* exposes what really happened aboard the orbiting disaster known as the *Mir* space station and see what made the *Mir* link-up one of the most dangerous missions in NASA history.
1 hr. **WG2513 $19.95**

To The Moon

This special shares vivid recollections of Apollo astronauts Gene Cernan and Frank Borman, and introduces you to legendary Flight Director Gene Kranz and other unsung heroes of the entire space program. Rare interviews and amazing footage capture America's full-thrust effort to be the first to the moon.
2 hrs. **WG2610 $19.95**
DVD 2 hrs. **WG998 $19.95**

Top Gun Over Moscow

For half a century we feared them. Now, for the first time, meet the rugged pilots of the Russian Air Force—and take a close-up look at the heart-stopping maneuvers that still fill Western flyers with awe.
1 hr. **WG2315 $19.95**

Venus Unveiled

Travel with the *Magellan* as it flies by Venus to reveal the planet's true face, one of the most bizarre in the solar system. *Educational use only.*
1 hr. **WGV2210* $19.95**

*No Retail Packaging

Volcanoes of the Deep

The pitch-black, near-freezing water nearly 8,000 feet below the ocean surface is the last place you'd suspect life to flourish. But here sea life thrives on mammoth superheated volcanic chimneys. Is the key to life's origins locked inside their fiery cores?
1 hr. **WG2609 $19.95**

Warnings from the Ice

Huge ice sheets in Antarctica may be in the process of collapse, triggering a catastrophic rise in sea level that will inundate the most populous regions of the world. Join scientists as they gather data that will reveal new insight into the nature of global climate change.
1 hr. **WG2508 $19.95**

What's Up with the Weather?

In this special two-hour program, *FRONTLINE* and *NOVA* take on one of the most complex and important challenges facing the world today—global warming. Take a dramatic journey to find out what's in store for our Earth's climate system.
2 hrs. **WG904 $19.95**

General Science

Anastasia Dead or Alive?

Investigate the massacre of Tsar Nicholas and his family, and evaluate whether modern science has resolved the mystery surrounding Princess Anastasia. 1 hr. **WGA2209 $19.95**

The Beast of Loch Ness

Is the Loch Ness Monster a hoax? Join *NOVA* for an all-out investigation of the mystery as scientists scour the loch with sonar and the most famous photo of Nessie is put to the test.
1 hr. **WG2601 $19.95**

Behind the Scenes with King Kong in Special Effects

Go behind the scenes as effects experts bring a legend to life in this exclusive look at how King Kong was created for the Oscar® nominated IMAX® film *Special Effects*.
33 min. **WG093 $12.95**

The Bermuda Triangle

An investigation of the mysterious watery graveyard in the Atlantic.
1 hr. **WGW264 $19.95**

Decoding Nazi Secrets

Historic, fascinating and filled with stunning revelations, *NOVA* presents the first fully detailed account of the greatest codebreaking coup of all time. In this two-hour special, hear American and British codebreakers reveal long-held secrets for the first time. 2 hrs. **WG2615 $19.95**

The Diamond Deception

What takes nature billions of years, man is doing now in a few days—creating flawless diamonds. *Educational use only.* 1 hr. **WGZ703 $19.95**

Escape! Because Accidents Happen Boxed Set

In the air, at sea, on the road, or in your home, you must be prepared to escape! *NOVA* goes behind the sensational headlines to examine the fascinating science of "survival engineering." Includes *Fire, Car Crash, Plane Crash* and *Abandon Ship*.
4 hrs. on 4 cassettes. **WGZ50 $49.95**

Everest: The Death Zone

Climb all the way from Base Camp to the very pinnacle of the earth at 29,028 feet. You'll witness first-hand why rational people can make astonishingly poor, and sometimes fatal decisions, on the world's highest peak. Narrated by Jodie Foster. By David Breashears, the Emmy® award-winning producer of the IMAX® film.
1 hr. **WG2506 $19.95**
DVD 1 hr. **WG800 $19.95**

Everest: The Mystery of Mallory and Irvine

Did George Mallory and Andrew Irvine reach the top of Mt. Everest in 1924, nearly 30 years before Sir Edmund Hillary and Tenzing Norgay? This award-winning film, produced by renowned climbers and filmmakers David Breashears and Andrew Harvard, takes a fascinating look at Mallory's courageous attempt and the enduring mystery surrounding his disappearance.
1 hr. **WG830 $19.95**

Evolution

Evolution offers a groundbreaking and definitive view of the extraordinary impact the evolutionary process has had on society and culture around the world. Beginning with Darwin's revolutionary theory, this seven-part series explores all facets of evolution, such as the changes that spawned the tree of life, the power of sex, how evolution continues to affect us every day, and the perceived conflict between science and religion.

The seven-part series includes: *Darwin's Dangerous Idea, Great Transformations, Extinction!, The Evolutionary Arms Race, Why Sex?, The Mind's Big Bang,* and *What About God?*. 8 hrs. on 7 cassettes.
WG1158 $99.95

Learning and Teaching Evolution

Teaching high school biology will never be the same! The *Evolution* project offers a wide variety of multimedia resources to enhance teaching and learning, including this video which offers a variety of educational approaches for teachers, and engaging science for students designed to help them grasp basic evolutionary concepts. Seven short segments (*Evolving Ideas Videos for Students*) combine storytelling and science to explore the concepts of evolution and spark students' interest in the topic. And four additional segments (*Teaching Evolution Case Studies*) highlight a range of strategies for teaching evolution in classrooms across the country, including ways to successfully and respectfully address the controversy that can arise. 2 hrs. **WG1302 $19.95**

Fall of the Leaning Tower

Tilting at an amazingly dangerous angle, the Leaning Tower's problem is obvious—its solution isn't. See how science is attempting to save a medieval masterpiece with a high-risk rescue plan that may add centuries to the life of this architectural treasure.
1 hr. **WG2611 $19.95**

Hitler's Lost Sub

In 1991, a German U-boat wreck was discovered off the New Jersey coast. But neither the US, British *nor* German military knew its identity until two divers and their dedicated team spent six long years searching for clues in the rusty remains. *Hitler's Lost Sub* embarks on a fascinating two-hour journey that traces submarine and World War II history; dives 230 feet into the ocean for a deep sea detective adventure; and travels to Germany to correct a significant part of military history. 2 hrs. **WG2712 $19.95**

*No Retail Packaging

Holocaust On Trial

British historian and author David Irving claims the Holocaust was a myth—that Hitler never mandated mass extermination of the Jews. Facing a charge of libel, Irving defended himself in the British court system in early 2000 against American scholar Deborah Lipstadt. *Holocaust On Trial* reconstructs the charged and dramatic courtroom proceedings as Irving defends himself and Hitler's Nazi atrocities. Haunting, unsettling, moving and enlightening, this film traces the rise of the Third Reich's Final Solution, recounts its unimaginable horrors through devastating and rare footage and explains the motives of those who continue to deny this atrocious history.

Educational use only. 1 hr. **WG2711 $19.95**

Hunt for Alien Worlds

All eyes are on the heavens in the search for planets around other stars, probably the best hope for finding that we are not alone in the universe. *NOVA* covers an effort that is turning up more and more new worlds.

Educational use only. 1 hr. **WG2407* $19.95**

Iceman

NOVA covers the international efforts to unlock the secrets behind the mummified body of a man who lived over 5,000 years ago.

Educational use only. 1 hr. **WG1916* $19.95**

Ice Mummies Boxed Set

You're there as the ice mummies are unearthed, as clothing and artifacts are studied, and as mysteries of the Stone Age are explained. Includes *Frozen in Heaven, Siberian Ice Maiden* and *Return of the Iceman*.

3 hrs. on 3 cassettes. **WG2525 $49.95**

In Search of Human Origins Boxed Set

The award-winning exploration of the beginnings and expansion of the human race. Includes *The Story of Lucy, Surviving in Africa* and *The Creative Revolution*.

3 hrs. on 3 cassettes. **WGW2111 $49.95**

In Search of the First Language

NOVA explores the common threads that link the more than 5,000 languages of Earth.

Educational use only. 1 hr. **WG2120* $19.95**

Kaboom!

Experience the ultimate chemical reaction—the explosion. With high-speed photography and dramatic reconstructions, *NOVA* examines the history of explosives and their role in accidents, war and terrorism. 1 hr. **WG2401 $19.95**

Kidnapped by UFOs

Meet the ordinary Americans who claim to have been kidnapped by UFOs and the experts who are researching their stories. 1 hr. **WG2306 $19.95**

The Killer's Trail

Did Dr. Sam Sheppard kill his wife? With the help of advanced technology, *NOVA* re-examines the 1954 murder of Marilyn Sheppard and the subsequent trials of her husband. America's most intriguing unsolved murder reveals fascinating new clues... and surprising new suspects. 1 hr. **WG2613 $19.95**

Lincoln's Secret Weapon

After four hours at near point-blank range, The Union's warship the USS *Monitor* battled the Confederacy's well-armored CSS *Virginia* to a draw, altering—in one morning—the course of the Civil War and naval combat. After serving less than 12 months on active duty, the USS *Monitor* sank in 230 feet of water off North Carolina's Cape Hatteras. Join an elite team of Navy divers attempting to retrieve priceless artifacts of naval history and discover the well-preserved secrets of the *Monitor*'s short-but-significant Civil War service. 1 hr. **WG2710 $19.95**

Lost at Sea: The Search for Longitude

Richard Dreyfuss narrates this riveting story of an ingenious country carpenter who discovered that the secret to navigation lay not just in the stars but in the mastering of time. Climb aboard an authentic tall ship and go back in time to see the quest for longitude unfold.

1 hr. **WG2511 $19.95**

Lost King of the Maya

For 400 years, Yax K'uk Mo's dynasty of Blood Lords presided over the Maya city of Copan, though generations of scholars have dismissed the story as pure myth. But now a team of archaeologists may have found his tomb. Will these archaeologists' discoveries transform the legend of Yax K'uk Mo from myth into reality?

1hr. **WG2804 $19.95**

Lost On Everest

The discovery of mountain-climbing pioneer George Mallory's body on Mt. Everest in May 1999 reveals new clues to his final hours and mountaineering's most haunting mystery.

1 hr. **WG2702 $19.95**

Lost Tribes of Israel

Nearly 3,000 years after their banishment, *NOVA* dispels both myth and fantasy in a dramatic genealogical quest that uses DNA evidence in the search for alleged descendents of Israel's Lost Tribes. 1 hr. **WG2706 $19.95**

A Man, A Plan, A Canal, Panama

Explore the mind-boggling construction of the Panama Canal through historic film footage, rare archival photographs and insightful narration from author-historian David McCullough. Get an unprecedented look at the people behind the Canal's deadly 30-year construction and witness its amazing present-day operation.

1 hr. **WG1415 $19.95**

Mystery of the First Americans

NOVA uncovers the astonishing history and explains the current Native American controversy over Kennewick Man—a 10,000-year-old Caucasoid discovered near Washington's Columbia River in 1996. 1 hr. **WG2705 $19.95**

Mysterious Mummies of China

Perfectly preserved 3,000-year-old mummies have been unearthed in a remote Chinese desert shedding new light on the contact between the East and West in the ancient world. But these don't appear to be the ancestors of the modern-day Chinese people—they have long, blonde hair and blue eyes.

1 hr. **WG2502 $19.95**

Nazi Prison Escape

Colditz Castle in eastern Germany was considered the most formidable prison of World War II, though over 300 men managed to escape. Join former prisoners as they revisit Colditz, discover hidden caches of tools and remnants of tunnels and watch as a replica of a glider is rebuilt and launched for the first time.

1 hr. **WG2803 $19.95**

*No Retail Packaging

NEW! Neanderthals on Trial

Are Neanderthals our ancestors? *NOVA* explores controversial evidence that the genes of these extinct hominids are mixed with our own. For all their brutish reputation, Neanderthals were highly-sophisticated survivors in Europe for over 200,000 years—until modern humans arrived from Africa 100,000 years ago. Now *NOVA* investigates what may have happened next.
1 hr. **WG2815 $19.95**

Nomads of the Rainforest

Visit the unique nomadic tribe of the Waironi Indians deep within eastern Ecuador.
1 hr. **WG1112* $19.95**

The Science of Crime Boxed Set

Serial criminals wield a particular brand of terror. Fortunately for us, scientific sleuths are on their trail. Includes *The Bombing of America, Mind of a Serial Killer* and *Hunt for the Serial Arsonist*. 3 hrs. on 3 cassettes. **WG164 $49.95**

Search for the Lost Cave People

Discover a lost civilization that inhabited caves high on the isolated cliffs of Southern Mexico nearly 1,000 years ago. The tantalizing clues, including graphic evidence of ritual child sacrifice and a sophisticated writing system, shed new light on this mysterious people, the Zoqui.
1 hr. **WG2507 $19.95**

Secrets of Lost Empires Boxed Set

Uncover the secrets of ancient civilizations as *NOVA* journeys to five archaeological sites where teams of experts use traditional techniques to test their hypotheses. Includes *Colosseum, Inca, Obelisk, Stonehenge* and *Pyramid*. 5 hrs. on 5 cassettes. **WG182 $69.95**

Secrets of Lost Empires II Boxed Set

Filled with powerful recreations and revealing insights, this ambitious *NOVA* series examines five ancient civilizations and their unique impact on the past . . . and on the future. Includes *Medieval Siege, Pharaoh's Obelisk, Easter Island, Roman Bath* and *China Bridge*.
5 hrs. on 5 cassettes. **WG898 $69.95**

Secrets of Making Money

Learn the secrets of counterfeiting—made easier by today's technology—and find out what the Feds are doing to fight back.
1 hr. **WG2314* $19.95**

Secrets of the Psychics

Are some of us born with mysterious powers—able to move objects at will, read a person's thoughts, even cure physical ailments with the power of the mind? Follow master magician James Randi as he uncovers the secrets about psychics. 1 hr. **WGW703 $19.95**

Submarines, Secrets and Spies

NOVA lifts the veil on deadly, mysterious submarine accidents and high-risk spy missions through candid interviews with Soviet and U.S. military personnel, shocking underwater footage and recently declassified film and documents.
1 hr. **WG2602 $19.95**

Sultan's Lost Treasure

In the South China Sea, prospectors spot an ancient shipwreck. A team of archaeologists dives down to retrieve a unique treasure—more than 12,000 intact pieces of Chinese porcelain. The priceless cargo poses countless riddles as they seek the identity of the ship and the meaning of the strange and delicate symbols on the dishes. *Educational use only.*
1 hr. **WG2801 $19.95**

Three Men and a Balloon

For a few diehard daredevils, it's "the last great challenge in aviation"—to fly a balloon non-stop around the world. Follow one of the foremost teams in a hair-raising race against time, technology, and hot competition.
1 hr. **WG2313 $19.95**

Titanic's Lost Sister

Search for the wreck of the *Britannic* and explore the clues as to how it sank. Four years after the *Titanic* went down, the *Britannic* sank in just one hour, despite an overhaul to meet post-*Titanic* standards.
1 hr. **WG2402 $19.95**

Treasures of the Sunken City

It's an undersea adventure in Cleopatra's erstwhile capital: Alexandria, Egypt, where marine archaeologists are frantically salvaging mysterious stone ruins from the harbor floor.
1 hr. **WG2417 $19.95**

The Tribe That Time Forgot

NOVA travels deep into the Amazon wilderness to search for a mysterious tribe that dismembered and partially ate three prospectors in 1976. 1 hr. **WG2115* $19.95**

UFOs: Are We Alone?

Using rare UFO footage, *NOVA* investigates the claims of sightings. 1 hr. **WGW262 $19.95**

Vanished!

On August 2, 1947, a primitive airliner took off from Buenos Aires. The *Stardust* never arrived at its destination. No wreckage was ever found, and the case of the vanished *Stardust* soon became one of aviation's most celebrated unsolved mysteries. Join *NOVA* on this gripping high adventure and scientific detective story. *Educational use only.* 1 hr. **WG2802 $19.95**

The Vikings

This riveting two-hour special investigates a new image of the Vikings that goes far deeper than their savage stereotype as raiding marauders. Faithful replicas of their magnificent ships, life-like computer animation and fascinating recreations reveal the Vikings as canny merchants, expert shipbuilders, superb artisans, and bold colonizers of lands that lay beyond the edge of the known world.
2 hrs. **WG958 $19.95**

Vikings in America

500 years before Columbus, the Vikings reached North America. Archaeologists are now revealing an extraordinary story of tragedy and triumph behind the myth. *Educational use only.*
1 hr. **WG2202* $19.95**

Voyage of Doom

The recent discovery of *Belle*, part of the fleet of fanatical French explorer Robert La Salle, has been called the most important shipwreck find in North America. Lying mud-covered and remarkably preserved on the bottom of a Texas bay, *Belle*'s final resting place was unfortunate for La Salle, but incredible for historians and archaeologists. Join the unprecedented excavation effort as *NOVA* reveals *Belle*'s vivid history, incredible artifacts and mysterious details. 1 hr. **WG2616 $19.95**

Warriors of the Amazon

See a rare glimpse of life today for the Yanomami, who live in a remote and inhospitable part of the Amazon rain forest.
1 hr. **WG2309 $19.95**

*No Retail Packaging

Life Science

NEW! 18 Ways to Make a Baby

With male couples having children through surrogates and donors, women over sixty having babies, and babies being born with borrowed DNA, options open to infertile couples are wider than ever before, not to mention the possibility of manipulating a child's DNA. *NOVA* covers the latest chapter in the reproductive revolution. *Educational use only.* 1 hr. **WG2811 $19.95**

All-American Bear

Share a year in the life of the North American black bear—mating, playing, foraging for food and hibernating. 1 hr. **WG1520* $19.95**

Animal Hospital

Go behind the scenes for this offbeat, sometimes humorous, sometimes sad portrait of pets, their owners and their vets and the drama that unfolds everyday in homes, zoos and veterinary hospitals.
1 hr. **WG2504 $19.95**

Animal Impostors

A gnarled twig. A stretch of sand. A shadow. Suddenly they twitch—or lunge—and you realize you've been taken in by a cleverly disguised animal. Some of the most astonishing scenes on television. 1 hr. **WG909* $19.95**

The Brain Eater

Scientists race to determine whether a variant of mad cow disease spells a deadly epidemic for humans. *Educational use only.*
1 hr. **WG2505* $19.95**

Brain Transplant

NOVA follows a remarkable, little-known medical detective story, leading from an inexplicable paralysis among drug abusers to a bad batch of synthetic heroin to a research breakthrough in understanding Parkinson's Disease, to the prospect of curing brain diseases with fetal implants. *Educational use only.*
1 hr. **WG1918* $19.95**

Buried in Ash

Learn what life was like eons ago when a volcanic eruption buried much of what is now Nebraska in up to ten feet of ash.
1 hr. **WG2117* $19.95**

Can Buildings Make You Sick?

Join *NOVA*'s quest to uncover baffling cases of bad air found in offices, schools, homes and even hospitals! *Educational use only.*
1 hr. **WG2217* $19.95**

Cancer Warrior

NOVA follows Dr. Judah Folkman as he pioneers a cancer treatment long dismissed by many in the cancer-research community. Finally, a scientist in Folkman's lab formulates Endostatin, which eradicates tumors in mice. Will it be as successful in humans? 1 hr. **WG2805 $19.95**
DVD. 1 hr. **WG1310 $19.95**

City of Coral

Dive into the beauty and wonder of a Caribbean coral reef. 1 hr. **WG1006* $19.95**

Coma

In a gripping real-life drama, *NOVA* follows famous neurosurgeon Jam Ghajar as he struggles to save a young boy with massive head trauma, using simple but crucial techniques that are dangerously absent from most hospitals across the country.
1 hr. **WG2411 $19.95**

Cracking the Code of Life

NOVA investigates the complex implications of the human genome project and the incredible impact that its discoveries will have on life in the 21st century.
2 hrs. **WG2809 $19.95**

Cut to the Heart

Can a radical form of surgery from the jungles of Brazil save desperately ill heart-disease patients? Watch this cutting-edge procedure in action at the prestigious Cleveland Medical Clinic and listen to the stories of those whose lives it has renewed. 1 hr. **WG2409 $19.95**

Dinosaurs of the Gobi

NOVA accompanies an American Museum of Natural History expedition to the Gobi Desert. The trip relives the exploits of the Museum's dashing explorer of the 1920s, Roy Chapman Andrews—said to be the real-life model for Indiana Jones. *Educational use only.*
1 hr. **WGW2102* $19.95**

Dinosaur Hunt Boxed Set

Of all the creatures that ever walked the earth, none captures the human imagination like the dinosaur. To some of us they are almost mythical, a modern-day version of the dragons and monsters of fairy tales. But to scientists they hold a different fascination, offering important clues to the mystery of the evolution of life. Includes *Curse of T. rex, Case of the Flying Dinosaur* and *T. rex Exposed*.
3 hrs. on 3 cassettes. **WG737 $39.95**

Dr. Spock the Baby Doc

Meet one of this century's most influential Americans and understand his profound impact on changing ideas about child care. *Educational use only.* 1 hr. **WG2308* $19.95**

Dying to Be Thin

Tormented by an irrational fear of being fat, an estimated eight million young women are torturing themselves—sometimes to death. *Dying to Be Thin* introduces you to students, ballet dancers, fashion models and other young women who are seeking recovery or have conquered their disease. Discover how leading eating disorder specialists are making dramatic advances in the diagnosis and treatment of these two devastating diseases.
1 hr. **WG2707 $19.95**

Ebola: The Plague Fighters

The Ebola virus and its devastating impact is profiled as *NOVA* travels behind the quarantine line to observe the scientists battling to contain this most deadly of viruses. 1 hr. **WG2304 $19.95**

Electric Heart

Brilliant surgeons Michael DeBakey, Robert Jarvik and Denton Cooley compete to develop the first successful electric heart for human transplant. *Educational use only.*
1 hr. **WG2617 $19.95**

NEW! Flying Casanovas

When European explorers first found tiny decorated huts in the rain forests of New Guinea, they thought these were homes of an unknown tribe of pygmies. In fact, they were bachelor pads built by the most remarkable of all animal architects—the bowerbird. *NOVA* explores the obsessive courtship practices of these lovestruck flyboys with filmmaker David Attenborough. 1 hr. **WG2818 $19.95**

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Garden of Eden

The Seychelles, often referred to as the Garden of Eden, is a stunningly beautiful island chain. This tropical archipelago off the coast of Kenya is home to a dazzling array of exotic plants and animals and is also a scientific wonderland due to the incredibly unspoiled nature of the islands and their wildlife.
1 hr. **WG2714 $19.95**

The Great Wildlife Heist

NOVA goes undercover with a U.S. government sting that breaks open an international parrot-smuggling ring, landing some surprising suspects. *Educational use only.* 1 hr. **WG2111* $19.95**

Haunted Cry of a Long Gone Bird

Explore the legacy of the great auk, a magnificent flightless bird that was hunted to extinction. *Educational use only.*
1 hr. **WG2113* $19.95**

Island of the Spirits

Mystical, magical and marvelous, Japan's northernmost island, Hokkaido, is filled with steaming lakes, fairy tale forests and wildlife as varied and unique as its terrain. Dazzling photography captures a year in the life of its rare inhabitants. *Educational use only.* 1 hr. **WG2614 $19.95**

Japan's Secret Garden

Follow a year in the life of a Japanese farm located on the shores of Lake Biwa, one of Japan's most pristine freshwater lakes. See how local farmers have developed a unique balance between humans and nature that continues to support rice fields and catfish ponds after over 2000 years of agriculture. 1 hr. **WG2716 $19.95**

Kingdom of the Seahorse

Witness a remarkable fish whose male becomes pregnant and gives birth. Tour the magical and complex world of the seahorse—from an underwater enclave in Australia to a village in the Philippines dependent on the seahorse for survival.
1 hr. **WG2410 $19.95**

Life's First Feelings

A look at babies' emotional responses, clues about developing personality traits and how parents help with socialization.
1 hr. **WG9304* $19.95**

Little Creatures Who Run the World

Peer close-up into the worlds of the most amazing ants and understand why some believe ants are the most successful life form on earth.
1 hr. **WG2203 $19.95**

Mammoths of the Ice Age

Ten thousand years ago, a world frozen in ice began to thaw, marking the beginning of the end for the great woolly mammoth. But what effect did humans have on these huge beasts? Frozen bodies and houses made of tusks are just some of the amazing new finds. Now scientists are piecing together a picture of the life our ancestors shared with the woolly mammoth.
Educational use only. 1 hr. **WG2201* $19.95**

MD: The Making of a Doctor

In this two-hour special, *NOVA* follows seven aspiring doctors as they undergo the exhilarating and rigorous years of medical training.
2 hrs. **WG2207 $19.95**

NEW! Methuselah Tree

A gnarled bristlecone pine tree in the White Mountains of California is the world's most ancient organism—almost 5,000 years old. In a remarkable film commissioned to celebrate the turn of the new millennium, *NOVA* explores the life and times of this sturdy survivor, relating its life to some of the most important historical events the world has ever seen.
Educational use only. 1 hr. **WG2817 $19.95**

The Miracle of Life

This Emmy® award-winning classic brings you along on an incredible microphotographic voyage through the human body as a new life begins, including the moment of conception.
1 hr. **WG001 $19.95**
DVD 1 hr. **WG799 $19.95**

Mystery of the Animal Pathfinders

Travel to bird feeding grounds in Brazil, bat caves in Mexico and eel habitats in Maine to understand the mystery of animal migration.
1 hr. **WGW710* $19.95**

Night Creatures of the Kalahari

When the sun sets over southern Africa, the grasslands' strangest and most secretive residents sneak out from their lairs. Witness bush babies, meerkats, striped polecats, brown hyenas, flying termites, and more rarely seen exotic creatures. *Educational use only.*
1 hr. **WG2501 $19.95**

Ninety in the 90s

Be inspired as the most senior of our citizens offer a unique perspective on their lives and the century's dramatic moments.
1 hr. **WG080* $19.95**

The Perfect Pearl

NOVA takes a deep look inside the pearl's precious world and reveals how these wonders of nature are fast becoming wonders of science. Trace the pearl's fascinating history and see how modern pearl cultivators are coping with complex natural, technological and environmental obstacles. 1 hr. **WG2507N $19.95**

The Private Lives of Dolphins

Discover the deep-sea drama of life for the ocean's most charming and sophisticated mammals.
1 hr. **WG1917 $19.95**

Rescuing Baby Whales

Join the dramatic rescue of young, stranded pilot whales, and learn what is behind this puzzling phenomenon. 1 hr. **WG1908* $19.95**

NEW! Search for a Safe Cigarette

Can science make a "safer" cigarette? As new brands with reduced emissions enter the market, *NOVA* probes the controversial quest for a less-toxic smoke. Are these products the answer to smoking related illnesses? Or are they simply the latest marketing strategy to increase cigarette sales? 1 hr. **WG2810 $19.95**

Secret of the Wild Child

NOVA profiles "Genie," a teenage girl whose parents kept her imprisoned in near-total isolation from infancy. *Educational use only.*
1 hr. **WG2112* $19.95**

NEW! Secrets of the Mind

NOVA profiles the work of eminent brain researcher Dr. V. S. Ramachandran, who studies patients with bizarre neurological deficits in order to learn more about the inner workings of the brain. Dr. Ramachandran studies find simple but intriguing clues that reveal the deep structure of emotion, perception and consciousness.
1 hr. **WG2812 $19.95**

NEW! Sex: Unknown

In 1965 a botched circumcision started an infant boy on a nightmare of medical meddling with his sexual identity. Born Bruce Reimer, he would be surgically castrated at age two and then raised as a girl, only later to insist that he be called David and restored as a male. *NOVA* tells the scientific side of his disturbing story, which has implications for what defines sexuality and gender. *Educational use only.*
1 hr. **WG2813 $19.95**

The Shape of Things

Marvel at the endlessly inventive patterns of natural things through photo-microscopy
1 hr. **WG1206* $19.95**

Shark Attack!

Are sharks developing a taste for human flesh? Join *NOVA* scientists as they discover some surprising truths about the way sharks kill
1 hr. **WG2316 $19.95**

Siamese Twins

Witness the intricate plans and delicate operations that give independence to two young girls who were born joined at the pelvis
1 hr. **WG2204* $19.95**

Stranger in the Mirror

NOVA explores the nature of human perception through the puzzling condition called visual agnosia—the inability to recognize faces and familiar objects—familiarized by Oliver Sacks' book *The Man Who Mistook His Wife for a Hat*
Educational use only. 1 hr. **WGW709* $19.95**

Surviving AIDS

Journey with *NOVA* to meet the scientists, physicians, and courageous patients whose cutting-edge experimentation and heroic acts will help achieve the ultimate goal: transforming every AIDS patient into a long-term survivor
1 hr. **WG2603 $19.95**

Survivor MD

This intimate portrait of a group of young doctors explores their growing expertise, struggles to balance professional and family life, and reflections on an arduous and uplifting decade of training
3 hrs. on 2 cassettes
WG2806 $29.95

Tales from the Hive

Using specially developed camera lenses, *NOVA* brings you the most intimate—and most spectacular—portrayal of a working bee colony ever filmed. 1 hr. **WG2701 $19.95**

Treasures of the Great Barrier Reef

Visit Australia's greatest natural wonder, and view the undersea world's brilliant colors and extraordinary inhabitants
1 hr. **WG2215 $19.95**

The Universe Within

Travel on an extraordinary visual tour inside the human body, with microphotography and computer animation achieved by the creators of *The Miracle of Life*. 90 min. *Educational version*
WG2206A* $19.95 1 hr. **WG2206 $19.95**

Wild Europe Boxed Set

Part travel adventure, part nature expedition, *Wild Europe* presents an untamed, unexpected experience that reveals a Europe few have ever seen. This stunningly filmed special unveils hundreds of European species in their natural habitats. Includes *Wild Seas, Wild Mountains, Wild Arctic, Wild Grasslands, Wild Origins* and *Wild Cities*. 6 hrs. on 6 cassettes **WG653 $69.95**

The Wonder of Life Boxed Set

Hidden from the human eye, the wonder of life unfolds in, on and around us with startling beauty and unexpected drama. Includes *The Odyssey of Life Set (The Ultimate Journey, The Unknown World, The Photographer's Secrets)* and *The Miracle of Life*
4 hrs. on 4 cassettes **WG177 $59.95**

Physical Science

The Best Mind Since Einstein

A profile of the late Richard Feynman—atomic bomb pioneer, Nobel prize-winning physicist, acclaimed teacher and all-around eccentric
Educational use only. 1 hr. **WGW708* $19.95**

Einstein Revealed

Journey into the life and thoughts of a genius—through interviews with "Einstein" (Andrew Sachs of *Fawlty Towers*), insight from experts, and some whimsical computer animation
2 hrs. **WG2311 $19.95**

Building Big with David Macaulay Boxed Set

Award-winning author-illustrator—and captivating storyteller—David Macaulay (*The Way Things Work*) goes to extremes in five really big adventures exploring the fascinating facts behind the greatest manmade wonders of the world. Includes *Bridges, Domes, Skyscrapers, Dams,* and *Tunnels*
5 hrs. on 5 cassettes **WG965 $69.95**

Building Big with David Macaulay Educational Curriculum

Explore large structures and what it takes to build them with this new five-part series. Hosted by David Macaulay, the award-winning author and illustrator of *The Way Things Work* and other books, each one-hour program focuses on a type of construction integral to modern life: bridges, tunnels, dams, skyscrapers, and domes. Discover the stories behind famous structures and their builders, plus how engineers today are building bigger than ever before. Each video also includes a short vignette featuring kids doing a simple hands-on engineering activity. Educators can easily re-create these activities using the printed instructions that are included. Also included is a short video for middle-school students that explores a key theme from the series, and a 40-page, full color activity guide
6 hrs. on 6 cassettes **WG982 $99.95**

Fast Cars

Follow a racecar driver and engineers as they design a faster car. 1 hr. **WG2208 $19.95**

Race to Catch a Buckyball

Learn about the chance discovery of an entirely new form of carbon—soccer-ball-shaped miraculous molecules called Buckyballs
Educational use only. 1 hr. **WGW716* $19.95**

Roller Coaster!

The thrill of the world's greatest rides and the science that creates them. *Educational use only*
1 hr. **WGW706* $19.95**

Super Bridge

Take a look at "the bridge of the future" and play sidewalk supervisor on one of the world's most remarkable and risky bridge projects—the building of the elegant, cable-stayed Clark Bridge spanning the Mississippi at Alton, Illinois
2 hrs. **WG2416 $19.95**

Time Travel

Join scientists Kip Thorne, Stephen Hawking and others to see a theoretical time machine that may someday make time travel a reality. *Educational use only.* 1 hr. **WG2612* $19.95**

Mathematics

Trillion Dollar Bet

NOVA follows the riches-to-rags story of two Nobel Prize-winning economists whose mathematical formula to accurately predict financial markets brought them both notoriety and disgrace. *Educational use only.*
1 hr. **WG2704 $19.95**

The Proof

Princeton math whiz Andrew Wiles spent eight secluded years perfecting the proof of Fermat's Last Theorem, a famous enigma that had stumped experts for 300 years. Follow a fascinating tale of obsession, secrecy, brilliance—and one man's inspiring single-minded quest. *Educational use only.* 1 hr. **WG2414 $19.95**

NOVA Field Trips

Amazing Animals

From bugs to bats and more. Includes *All-American Bear, Little Creatures Who Run the World* and *Mystery of the Animal Pathfinders.* Teacher's guide included. 3 hrs. on 3 cassettes.
WG089 $49.95

Creatures of the Sea

Dive deep for an underwater visit with the ocean's most fascinating creatures. Includes *Shark Attack!, Private Lives of Dolphins* and *Treasures of the Great Barrier Reef.* Teacher's guide included.
3 hrs. on 3 cassettes.
WG091 $49.95

Discovering Ancient Cultures

Investigate new clues for ancient cultures. Includes *This Old Pyramid* (90 min.), *Vikings in America* and *Warriors of the Amazon.* Teacher's guide included. *Educational use only.*
3.5 hrs. on 3 cassettes. **WG092 $49.95**

The Doctors

Watch doctors operate behind the scenes. Grades 7 and up. Includes *MD: The Making of a Doctor* (2 hrs.) and *Ebola: The Plague Fighters.* Teacher's guide included.
3 hrs. on 2 cassettes. **WG104 $49.95**

The Earth

A close-up look at some of Earth's most spectacular phenomena. Includes *In the Path of a Killer Volcano, The Day the Earth Shook* and *Flood!.* Teacher's guide included.
3 hrs. on 3 cassettes.
WG110 $49.95

Exploring Space

View the universe from new perspectives. Includes *Countdown to the Invisible Universe, Death of a Star* and *Rescue Mission in Space.* Teacher's guide included.
3 hrs. on 3 cassettes. **WG107 $49.95**

Fast Physics

Understand the thrill and power of motion. Includes *Roller Coaster!, Fast Cars* and *Daredevils of the Sky.* Teacher's guide included. *Educational use only.*
3 hrs. on 3 cassettes. **WG086 $49.95**

Flight

Feel the exuberance and the thrill of flight. Includes *Top Gun Over Moscow, Three Men and a Balloon* and *Aircraft Carrier!.* Teacher's guide included. 3 hrs. on 3 cassettes. **WG111 $49.95**

NEW! Health Matters

Explore heath issues—from the serious to the unknown. Includes three *NOVA* videos and a teacher's guide. *Dying to Be Thin, Surviving AIDS* and *The Unknown World.*
3 hrs. on 3 cassettes. **WG1156 $49.95**

The Human Body

The intricate wonders of the human body are revealed in extraordinary visual detail. Includes *The Miracle of Life, The Universe Within* and *The Ultimate Journey.* Teacher's guide included.
3.5 hrs. on 3 cassettes.
WG085 $49.95

In Search of Human Origins

The development of the human race. Includes *The Story of Lucy, Surviving in Africa* and *The Creative Revolution.* Teacher's guide included.
3 hrs. on 3 cassettes. **WG109 $49.95**

NEW! Math Mysteries

Explore some of math's greatest mysteries. Includes three *NOVA* videos and a teacher's guide: *The Proof, Lost at Sea: The Search for Longitude* and *Decoding Nazi Secrets.* *Educational use only.*
4 hrs. on 3 cassettes. **WG1155 $49.95**

The Mysteries of the Mind

Explore the intriguing phenomena of perception, psychological development, and reports of alien abductions. Includes *Kidnapped by UFOs, Secret of the Wild Child* and *Stranger in the Mirror.* Teacher's guide included. *Educational use only.*
3 hrs. on 3 cassettes. **WG105 $49.95**

The Planets, The Stars and More

Visit extraordinary places in the universe. Includes *Venus Unveiled, Eclipse of the Century* and *Doomsday Asteroid.* Teacher's guide included. *Educational use only.*
3 hrs. on 3 cassettes. **WG087 $49.95**

Scientific Detectives

Search for answers to intriguing mysteries. Includes *Codebreakers, Hunt for the Serial Arsonist* and *In Search of the First Language.* Teacher's guide included. *Educational use only.*
3 hrs. on 3 cassettes. **WG090 $49.95**

Secrets of Lost Empires

Travel to five archaeological sites with *NOVA* and their teams of experts. The mission? To replicate ancient engineering feats—using traditional tools. Includes *Stonehenge, Inca, Obelisk, Colosseum* and *Pyramid.* Teacher's guide included.
5 hrs. on 5 cassettes. **WG304 $69.95**

NEW! Weird Weather

Weather phenomena that will leave you wondering! Includes three *NOVA* videos and a teacher's guide: *What's Up with the Weather?, Chasing El Niño* and *Warnings from the Ice.*
4 hrs. on 3 cassettes. **WG1157 $49.95**

Wild Weather

Join "stormchasers" on a journey into danger to learn how to tame nature's fury. Includes *Lightning!, Tornado!* and *Hurricane!.* Teacher's guide included.
3 hrs. on 3 cassettes. **WG088 $49.95**

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Instructional Videos

Fast Cars Modules Set

Understand cars to understand physics. *Invisible Forces of Winds* puts students at the controls of an Indy 500 race car to demonstrate aerodynamics. *To Survive at High Velocity* demonstrates how vectors show how "corners make the driver and the car." *Test Day* lets you understand the complexity of race cars by testing every variable on the track. In *A Racing Engine for the Indy 500*, two companies battle to harness energy to create power. Teacher's guide included. *Educational use only*.
1 hr. on 4 cassettes. **WG2208A* $49.95**

Learning That Works

A unique three-video set and an 80-page comprehensive facilitator's guidebook that demonstrates the benefits of learning science with real world applications. *Learning That Works* presents options for teaching science that integrates what students learn in their science classes with what they do at work or in the community.
2 hrs. on 3 cassettes. **WG983 $99.95**

Physics By Inquiry

Physics By Inquiry: A Video Resource illustrates a hands on, inquiry-oriented approach to the study of science that can strengthen teachers' understanding of basic physics and physical science and help them begin to teach through inquiry.
90 min. **WG969 $19.95**

Science First Hand Set

Observe teachers and students at work. *Structures* – Designing houses, bridges and towers to explore force, tension and compression. *Tops and Yo-Yos* – Understanding rotational motion by designing and building tops and yo-yos. *Waterwheels* – Simple machines that demonstrate efficiency, speed and testing variables. Teacher's guide included. *Educational use only*. 105 min. on 3 cassettes.
WG005 $39.95

Science K-6: Investigating Classrooms

Step inside three elementary classrooms to see what teachers from around the country are doing to incorporate in-depth investigations into their science lessons. This library of nine videos and a 110-page Facilitator's Guide are an invaluable resource in learning and refining the fine craft of teaching by observing and discussing real classrooms. The teachers offer themselves and their students as case studies in an effort to raise questions and inspire discussions about what it takes to prepare scientifically literate students.
7 hrs. on 9 cassettes. **WG545 $199.95**

Core Curriculum Sets

The *NOVA* Core Curriculum Sets include a collection of six compelling videos perfect for providing visual support to any science curriculum.

Biology

The Miracle of Life, Ebola: The Plague Fighters, MD: The Making of a Doctor, The Unknown World, The Universe Within, The Ultimate Journey. Educational use only.
7.5 hrs. on 6 cassettes. **WG972 $89.95**

Earth

Avalanche!, In the Path of a Killer Volcano, Volcanoes of the Deep, Everest: The Death Zone, Adrift on the Gulf Stream, The Day the Earth Shook. 6 hrs. on 6 cassettes. **WG979 $89.95**

Math

The Proof, Trillion Dollar Bet, Decoding Nazi Secrets, Lost at Sea: The Search for Longitude, Time Travel, Chip vs. the Chessmaster. Educational use only. 7 hrs. on 6 cassettes.
WG974 $89.95

Physics

Fall of the Leaning Tower, Einstein Revealed, Roller Coaster!, The Best Mind since Einstein, Fast Cars, Daredevils of the Sky. Educational use only. 7 hrs. on 6 cassettes. **WG973 $89.95**

Weather

Tornado!, Hurricane!, Lightning!, Flood!, Chasing El Niño!, What's Up with the Weather?
7 hrs. on 6 cassettes. **WG978 $89.95**

Also available: *NOVA* Core Curriculum Sets focusing on Dinosaurs, Engineering, Forensics, Nature and Space.

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The *NOVA Teacher's Guide* is produced by the Educational Programming and Outreach department of the WGBH Educational Foundation.

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The NOVA television series is produced by WGBH Boston, which is solely responsible for its content, and distributed by the Public Broadcasting Service.

Major funding for NOVA is provided by

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We'd like to know what you think about NOVA, this *Teacher's Guide*, and our online activities. Please write to:

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Major funding is provided by Sprint PCS Northwestern Mutual Foundation PARK FOUNDATION